LINEARCORDER MARK VII

WR3310

MANUAL NO. WR3310-UM-251

SERVICE MANUAL

GRAPHTEC

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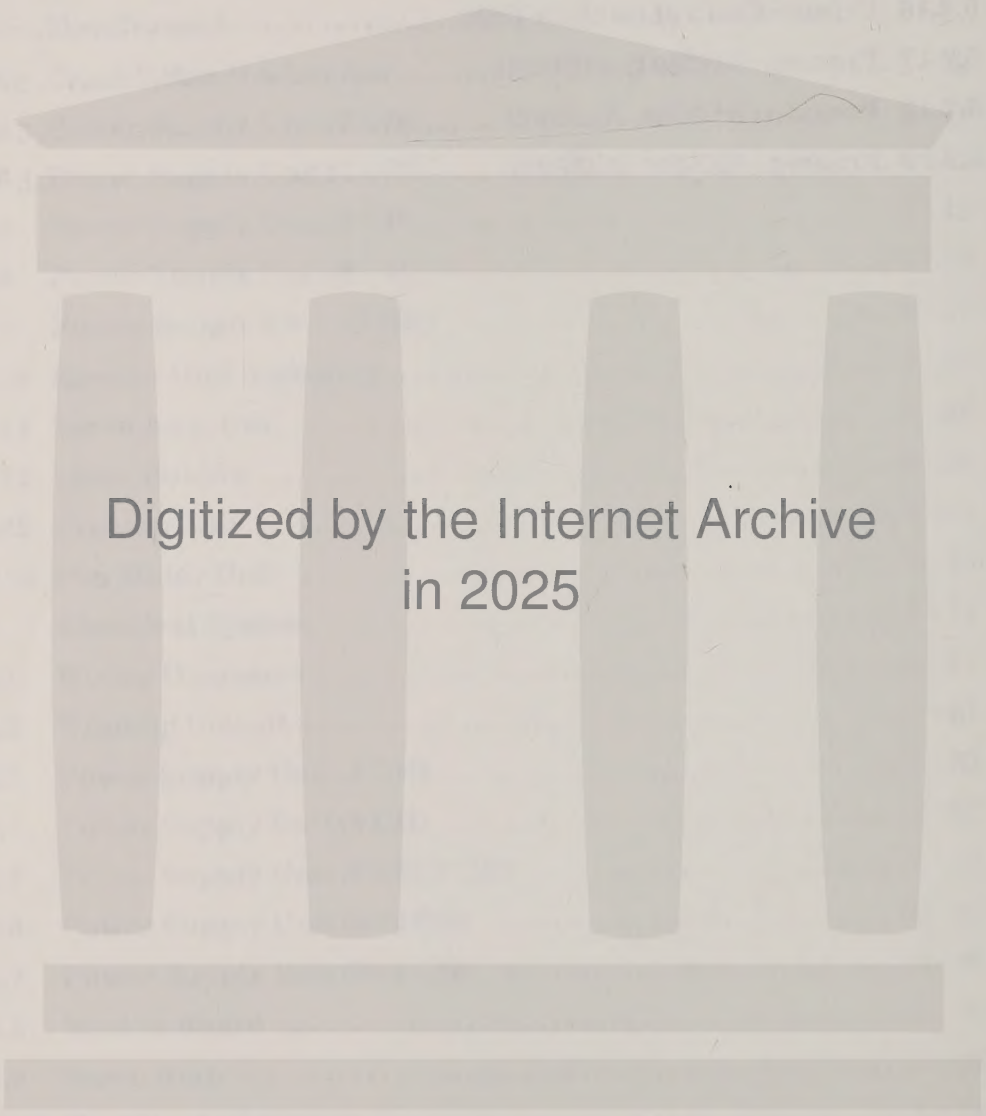

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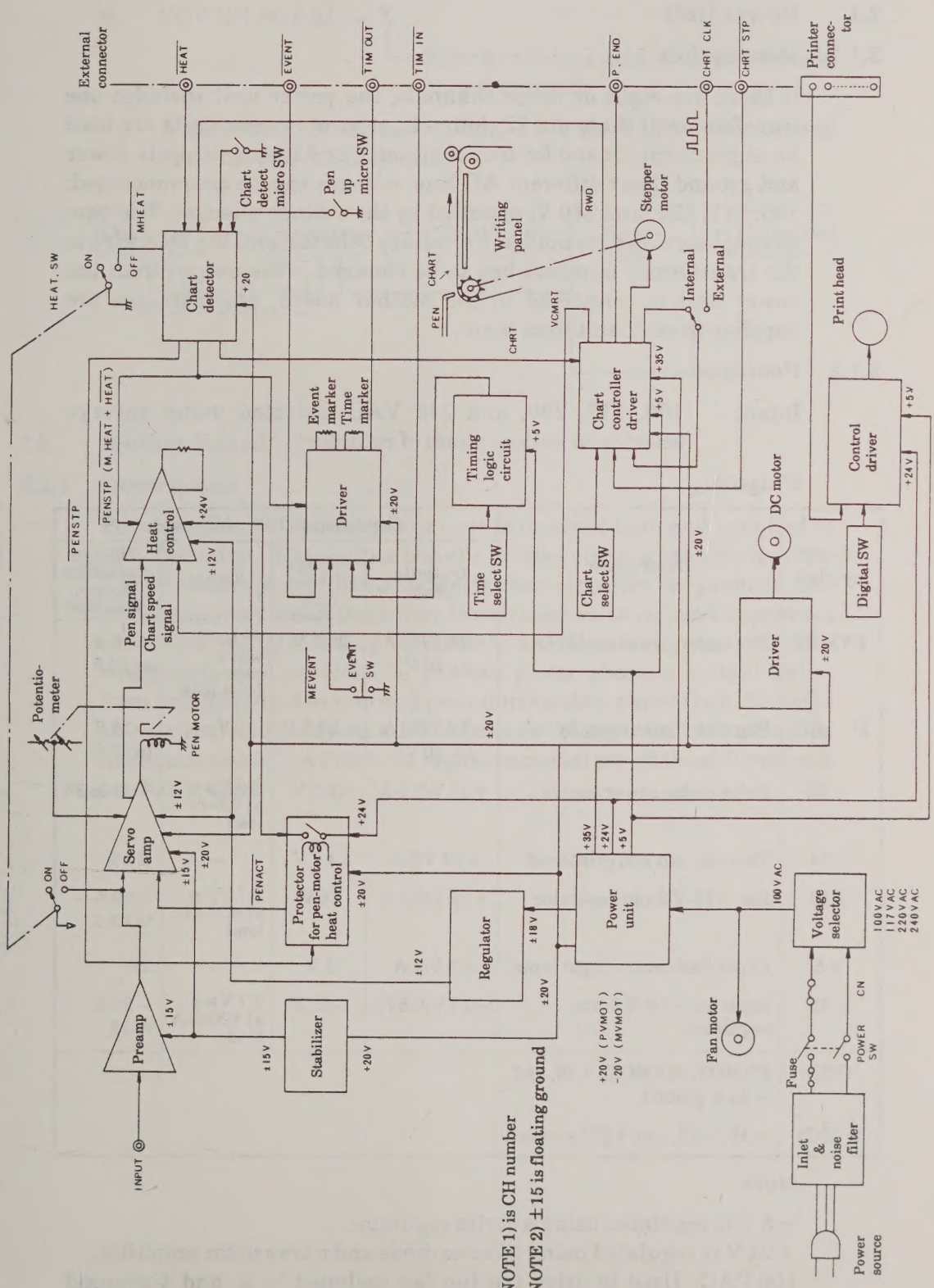
1. BLOCK DIAGRAM



NOTE 1) is CH number

NOTE 2) ±15 is floating ground

2. BLOCK OPERATIONS

2.1 Power Unit

2.1.1 Description

If there are eight or fewer channels, the power unit includes one transformer (if there are 12 channels, separate power units are used for eight channels and for four channels), and it supplies only power and ground. Four different AC line voltages can be accommodated: 100, 117, 220, and 240 V, specified by the voltage selector. The two-channel version does not have a voltage selector, and the lead wire to the transformer terminal has to be changed. The output from the power unit is connected to the mother board, and voltages are supplied to each unit from there.

2.1.2 Features

Input: 100, 117, 220, and 240 VAC (selected using voltage selector on bottom panel of recorder)

Outputs

Circuit symbol	Description	Condition at 100 VAC input			
		Output specs.	Voltage without load	Ripple	Voltage variation range with load
PVMOT	Pen motor power supply (+)	+16 V/10 A (+20 V)	22.5 V	At half-wave capacity, 10-A load	+16.6 to 22.5
MVMOT	Pen motor power supply (−)	−16 V/10 A (−20 V)	−22.5 V	3 Vp-p	−16.6 to 22.5
+35	Pulse motor power supply	+35 V/2.5 A	42.5 V	2.5 Vp-p at 2.5-A load	+33 to 39
+24	Thermal pen and printhead	+24 V/5 A	23.7 V	—	±1%
+18	For +12-V 3-pin regulator	+18 V/0.5 A	26 V	2.7 Vp-p at 400-mA load	+20.5 to 23.3
+5	Paper feed control logic input	+5 V/1 A	5 V	—	2%
−18	Input for −12-V 3-pin regulator	−18 V/0.5 A	−26 V	2.7 Vp-p at 400-mA load	−20.8 to 23
GND	PVMOT, MVMOT, +35, and +24 V ground				
SGND	+18, −18, and +5 V ground				

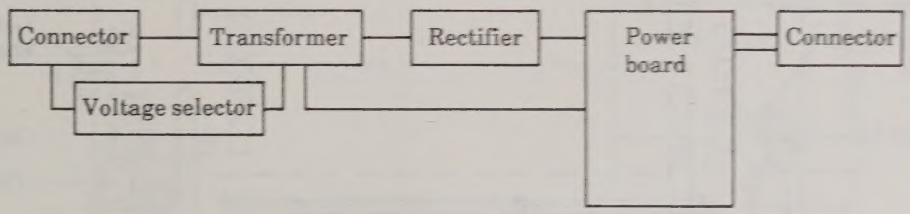
Note

+5 V is regulated using a series regulator.
+24 V is regulated using a Zener diode and a transistor amplifier.
100 VAC: Used to drive fan (no fan included in 2- and 4-channel models)

2.1.3 Configuration

- POWER BOARD – X
  - 8 for 6 or 8 channels, 4 for 4 channels, 2 for 2 channels

A smoothing capacitor, rectifier, +5-V three-pin regulator, and other devices are included.



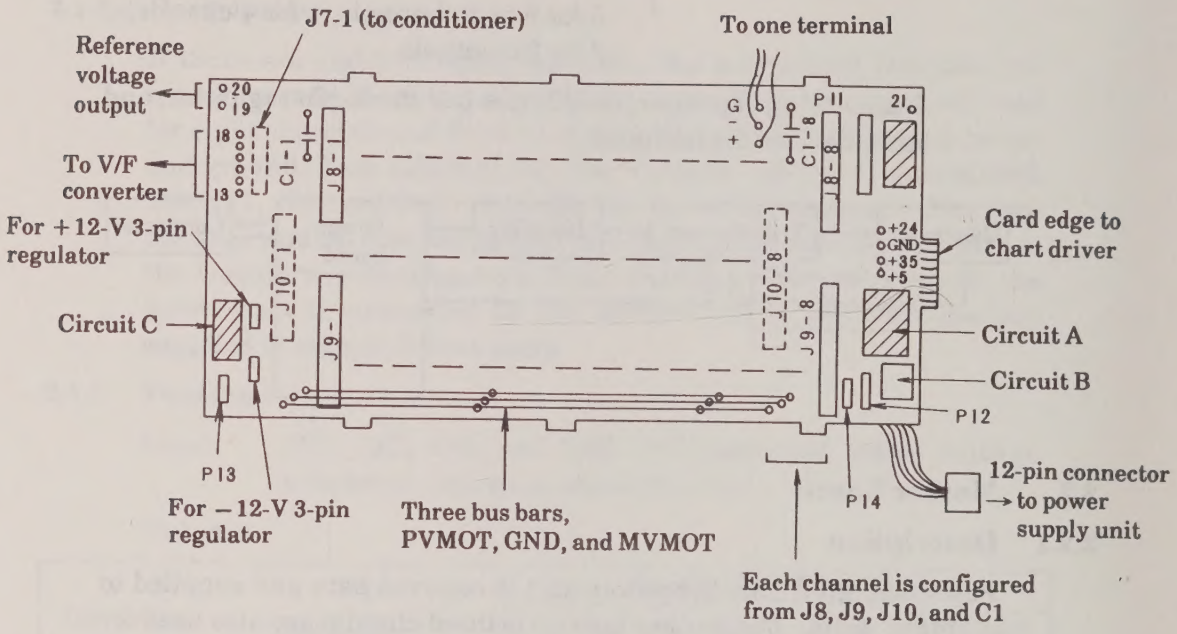
2.2 Mother Board

2.2.1 Description

Power supplied from the power unit is received here and supplied to all other units. The mother board's printed circuits are also used for signal exchange. It includes protection circuitry to prevent pen motor runaway when the power is switched on or off, and to prevent excessive voltages being applied to the thermal pens. Clamp circuitry is also provided to prevent power above a certain value from being applied to thermal pens during slow paper feed. There is also a circuit that outputs a 1-V reference voltage. An instantaneous motor current of 2-A (16-A for eight channels) per channel flows, so a bus bar is used.

2.2.2 Configuration

- Basic Configuration



Eight-Channel Mother Board Component Side Layout

- Configuration by Number of Channels

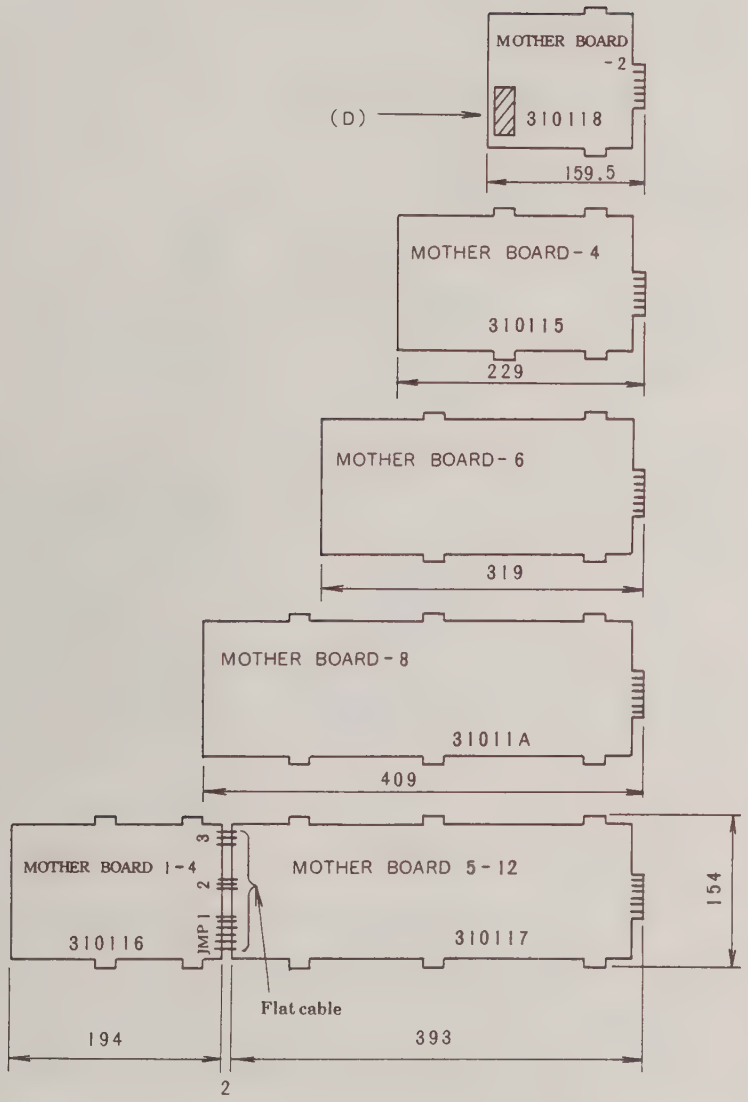
2 CH

4 CH

6 CH

8 CH

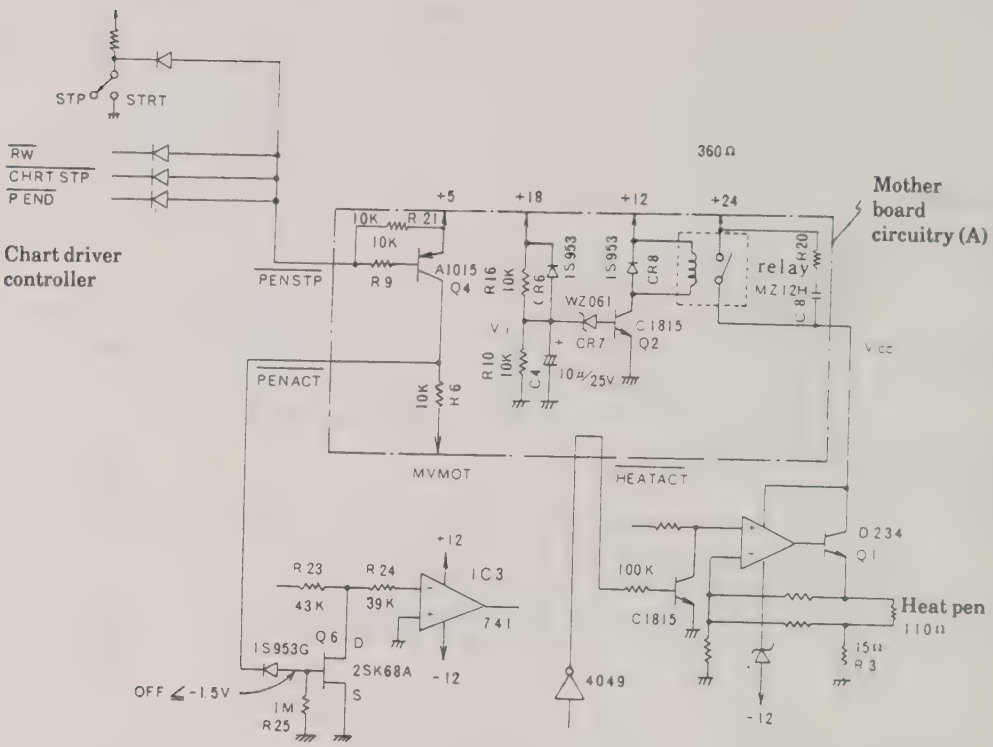
12 CH



Note that a smoothing capacitor and other components for the power supply (PVMOT, MVMOT) for the pen motor are mounted on the two-channel board.

2.2.3 Operation

- Circuit A



When power is turned on or off, voltages in various circuits are not at their normal values, but are in transient conditions, so that power applied to the thermal pen would cause it to deflect erroneously. It is precisely the function of this circuit to prevent this from happening and simultaneously to prevent pen runaway.

Signal name			
$\overline{\text{PENSTP}}$	Input	When high level, pen motor operates When low level, torque is not applied to pen motor	
$\overline{\text{PENACT}}$	Output	When less than −1.5 V, pen motor operates When more than −1.5 V, torque is not applied to pen motor	
$\overline{\text{HEATACT}}$	Output	When less than 0.6 V, thermal pen can record When more than 0.6 V, thermal pen cannot record	

This pen runaway prevention circuit accepts the chart drive circuit signal ($\overline{\text{PENSTP}}$) when it is in the normal condition, and sets the pen motor drive circuit input terminal to 0 V under the following conditions:

- When the paper feed switch is set to STOP;
- during rewind;
- when the paper is out; and
- when the pen lift lever is raised.

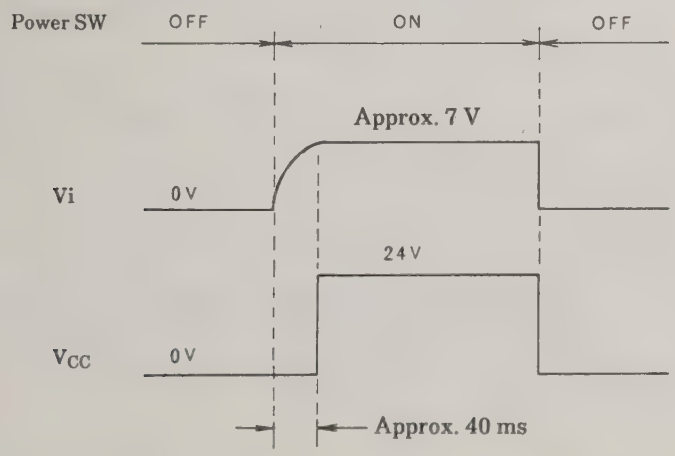
a) Pen Motor Protection Circuit Operation

When the gate voltage of the 2SK68-A (FET switch) in the servo amplifier falls below −1.5 V, this switch goes off, and the pen motor operates.

When paper is out or when the STOP switch is pressed, transistor Q4 goes on, and $\overline{\text{PENACT}}$ becomes approximately +5 V. Thus, FET switch Q6 turns on, IC3 input is driven to ground, and the pen motor goes into the free condition.

b) Thermal Pen Protection Circuit Operation

VCC is supplied to the thermal pens immediately power is turned on. When power is turned off, the +24 V supplied to the thermal pens is instantaneously interrupted by this circuit. A relay is used for this purpose.



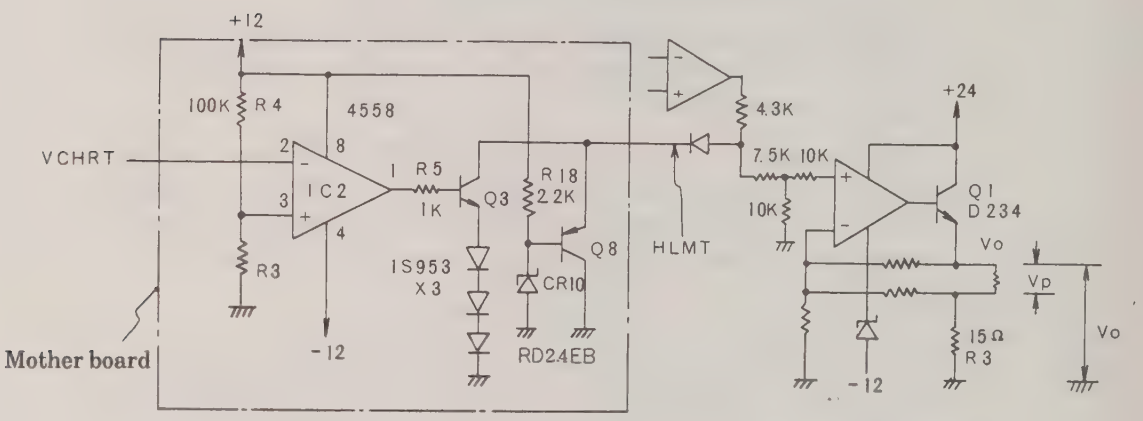
After power is turned on, Vi increases under control of a time constant established by a resistor and a capacitor, and once the Q2 threshold potential of approximately 7 V is reached, Q2 turns on, the relay operates, and +24 V is supplied.

When the power is turned off, discharge occurs through IS953, which means that the time constant is extremely short, and consequently the relay drops out quickly.

- Circuit B

When paper feed speed is slow, if the pen is deflected at a high frequency, recording line density increases, thermal pen heat dissipation deteriorates, and this can reduce the life of the thermal pen.

To prevent this, clamping is performed when paper feed speed is below approximately 19 m/s to ensure that a voltage greater than 8 V is not applied to the pen heating element even if the pen deflects at a high frequency.



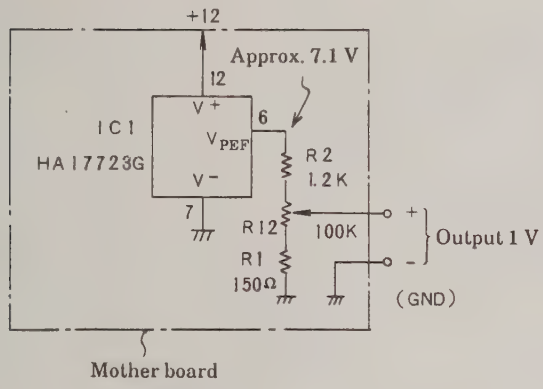
Heat control circuit

VCHRT is the paper feed speed signal, a voltage proportional to the paper feed speed (250 mV at 100 mm/s). IC2 operates as a comparator.

Feed speed	IC2 output	Q_3	HLMT	Thermal pen (+) side voltage (w.r.t. GND)
Less than 19 mm/s	+10 to +12 V	ON	Approx. +2.3 V	$V_O \simeq 8$V (Vp≃7 V)
More than 19 mm/s	−10 to −12 V	OFF	Approx. +3.9 V	$V_O \simeq 13$V (Vp≃11 V)

When the pen deflects at several tens of Hertz, the thermal pen limiter voltage Vp takes the values listed in the table above.

- Circuit C



This circuit generates a +1-V reference voltage, and it voltage divides the HA17723G internal reference voltage (approx. 7.1 V) to provide the required output.

The output resistance is approximately 200 Ω.

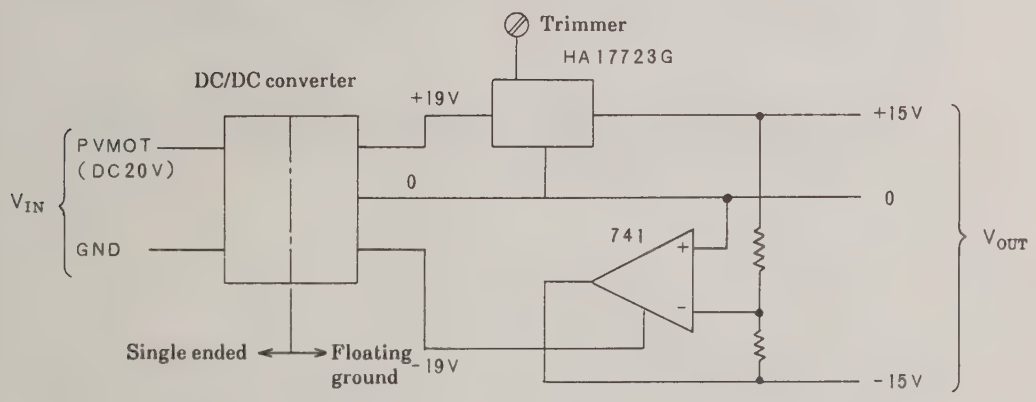
2.3 Regulator

2.3.1 Description

This regulated power supply outputs ±15 V, which is supplied to the preamplifier, servo amplifier input section, and the pen signal input section of the heater circuit. It uses a DC/DC converter which takes the single-line voltage PVMOT (DC) as input, and uses a 723 regulator IC and a 741 operational amplifier to produce ±15 V from its ±19 V output.

Protective circuitry is included to prevent damage in the event that the +15 V or −15 V is shorted to ground. When this happens the output is floated with respect to input.

2.3.2 Block Diagram



2.3.3 Description

Parameter		Specification	Remarks
Input voltage	V_{IN}	11 to 24 VDC (single-line ground)	
Input power	P_{IN}	2.8 $W_{TYP.}$ at ±45 m-A load 0.8 $W_{TYP.}$ at ±5 m-A load	
Output voltage	V_{OUT}	±15 V ±0.2%	Can be set to within ±0.1%
Max. output current	MAX I_{OUT}	±45 mA	+34 m-A and −29 m-$A_{TYP.}$ when preamplifier, servo amplifier, and heater circuit are operating
Residual ripple		Approx. 7 mVp-p (100 kHz)	At standard load

2.4 Servo Amplifier

The servo amplifier includes the pen motor and a potentiometer.

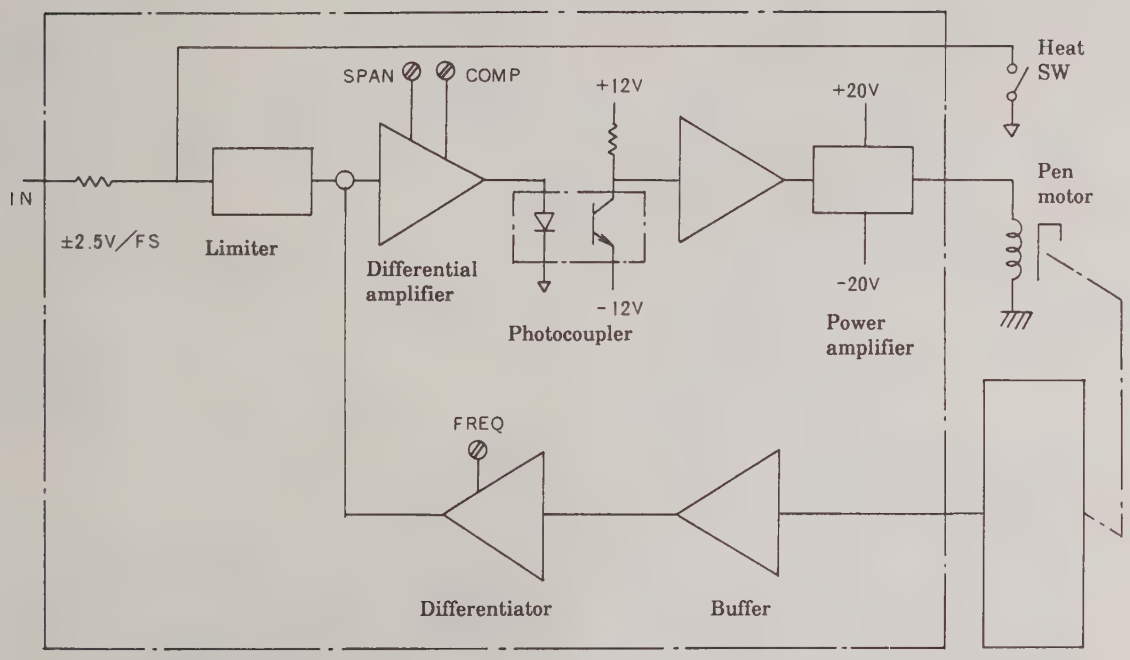
2.4.1 Description

This is the drive circuit for the pen motor, the input section and the output section being isolated using photocouplers. Thus, three power supplies are used: the ±15-V floating power supply used to drive the input section, and the ±20-V and ±12-V single-line power supplies used to drive the output section (power stage).

It features an input sensitivity of ±2.5 V/full scale, a frequency response of 140 Hz (amplitude: 10 mm_{pp}), and an accuracy at full scale of ±0.5%.

It includes an electronic limiter to limit pen deflection angle with excessive inputs, and an FET and switches to set the pen motor into the free state during paper rewind.

2.4.2 Block Diagram



Note

⊘ indicates trimmers.

2.4.3 Features (per channel)

	GS TYPE PEN MOTOR 40 mm span	GW TYPE PEN MOTOR 80 mm span	
Power supply used	Input section ±15 V ±0.2% (+20 m-A, −17 m-A_{TYP}) Output section ±12 V ±0.5 V (±3 m-A_{TYP})		Floating ground Single-line ground (common to all channels)
	Output section ±12 to 24V ±470 m-A at 60 Hz, 40 mm_{pp} ±550 m-A at 120 Hz, 10 mm_{pp}	Output section ±12 to 24V	
Recording amplitude	±20 mm	±40 mm	
Input format	Floating		
Input resistance	Potentiometric		
Circuit configuration	DC servo (isolation amplifier)		
Sensitivity	±2.5 V/4 cm	±2.5 V/8 cm	Input and output polarities are opposite
Input limiter voltage	±2.759, ±0.4%	±2.708, ±0.4%	
Accuracy	±0.5% of full scale		
Frequency response	10 mm_{pp} 0 to 140 Hz +5% −10% 20 mm_{pp} 0 to 100 Hz +5% −10% 40 mm_{pp} 0 to 60 Hz +5% −10%	20 mm_{pp} 0 to 60 Hz +5% −10% 40 mm_{pp} 0 to 45 Hz +5% −10% 80 mm_{pp} 0 to 30 Hz +5% −10%	

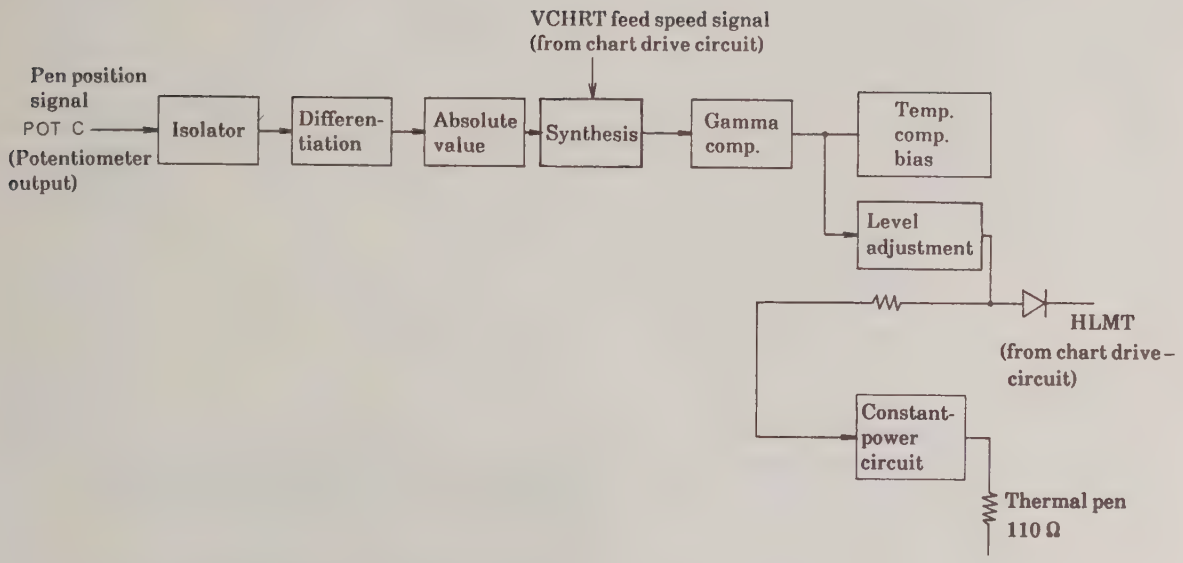
2.5 Heat Control Circuit

2.5.1 Description

This accepts pen signals and paper feed speed signals and uses them to control the voltage applied to the thermal pens. The pen signal is the potentiometer output representing pen position data, and the paper feed speed signal is a DC voltage proportional to the speed. The paper feed speed is received from the chart drive circuit. Thus, it is basically a DC circuit. Acceleration data is also detected to improve recording at the rising edge section of a squarewave, and an instantaneous pulse is applied to the thermal pen at initiation of the squarewave.

The circuit is also designed to inhibit application of the pulse when repeated squarewaves are applied, to limit the build-up of heat.

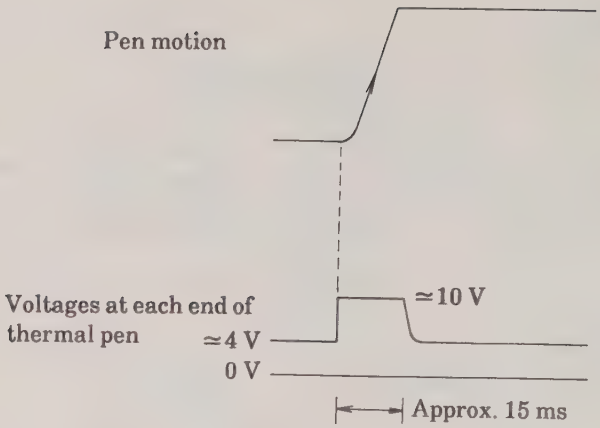
2.5.2 Block Diagram



2.5.3 Operational Description

The pen position signal is the output from the potentiometer, and is floating with respect to ground. All other sections are in the single-line ground system. Photocouplers (isolators) are used to connect these two parts.

The pen position signal is converted to a speed signal to synthesize the paper speed signal, and gamma-compensation is performed. A DC bias voltage is superimposed on this, the heat control trimmer is used for adjustment, and the result is applied to a constant-power circuit.



When several squarewaves are applied in succession, the comparator operates to interrupt the acceleration signal thereby reducing the height of the pulse.

The following tables list typical values of the pen position signal and the chart feed speed signal.

Pen position signal

Pen amplitude	POTC Voltage
GS Type 40 mm_{pp} GW Type 80 mm_{pp}	(700 ±230) mVpp

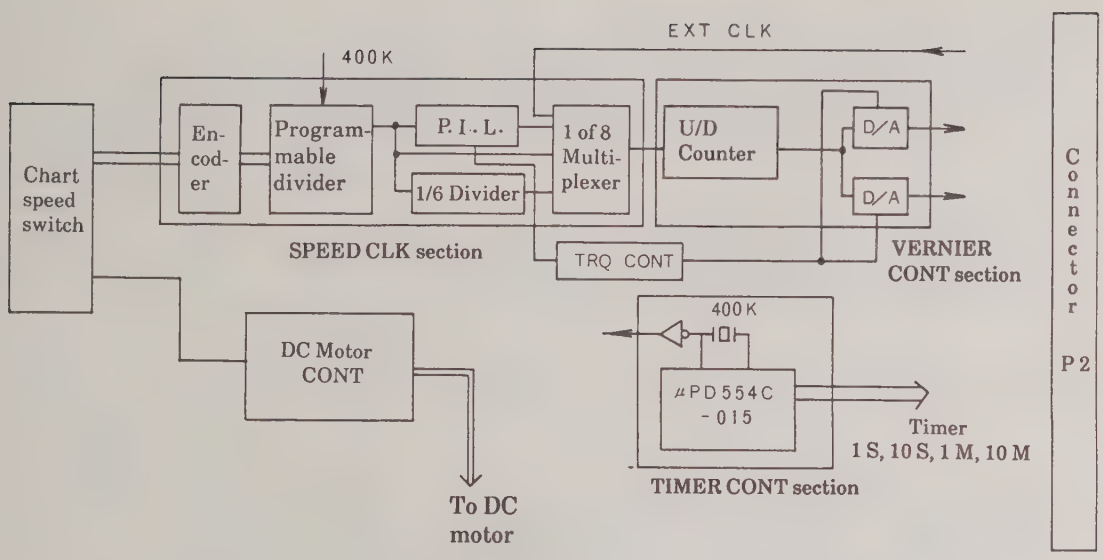
Feed speed signal

Chart speed	V CHART Voltage
10 mm/s	25 mV
50 mm/s	125 mV
100 mm/s	250 mV
500 mm/s	1.25 V

Other speeds and voltages are proportionally related.

2.6 Chart Controller

As the diagram below indicates, this is divided into the Speed CLK section, which establishes the speed of the stepping motor, the VERNIER CONT section consisting of a up/down counter and D/A converters; the DC Motor CONT section for rewinding the paper; and the timer CONT section which uses a 4-bit processor.



PR3101-40

BLOCK DIAGRAM

2.6.1 SPEED CLK Section

This section outputs the clock pulse corresponding to the specified paper feed speed by dividing 400 kHz.

- The frequency output by the programmable divider is as follows. (IC2 pin 9 output)

  SEC feed .... 80N · (Hz)

  MIN feed .... 8N · (Hz)

  (N is the number indicated by the button pressed. It is this in what follows also.)

- The frequency output by the 1-of-8 multiplexer is as follows. (IC11 pin 3 output)

  SEC feed .... 80N · (Hz)
  (At speeds above 100 mm/s, this value applies after acceleration is completed.)

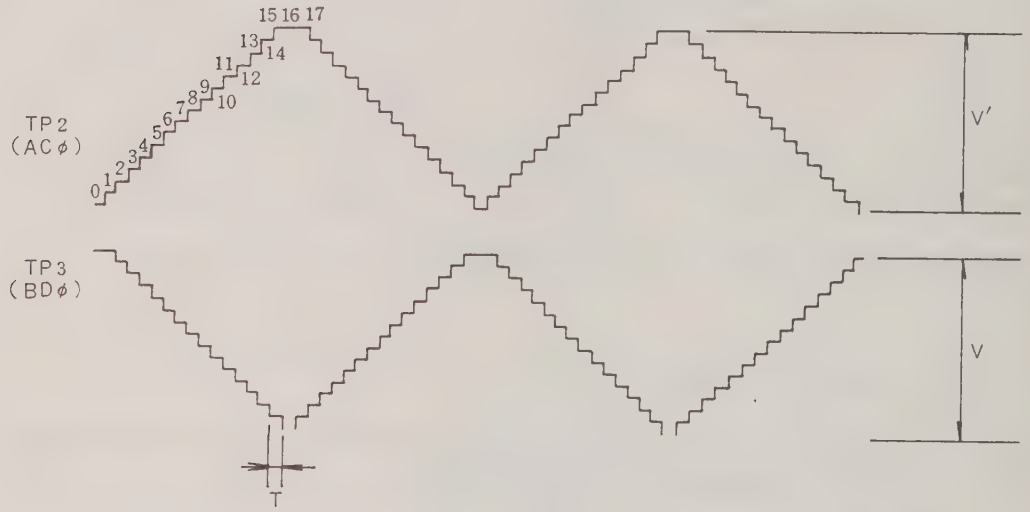
  MIN feed .... 4/3N · (Hz)

2.6.2 VERNIER CONT Section

The clock pulse output by the SPEED CLK section is passed through the up/down counter and converted to the voltage for the stepping motor vernier drive and output. The output is shown in the figure below.

Note

TP2 and TP3 are measured with TP1 as a reference.



V' can be varied from approximately 0.9 V using VR1. When readjusting, it is extremely important to adjust using VR1 so that V = V'.

T in the illustration above is as follows.

Sec feed ..... T = 1/80N (s)

Min feed ..... T = 3/4N (s)

The relationship between the speed and V is given by the following table.

SPEED	V
50 mm/s or less	≈ 1.4 V
100 mm/s	≈ 1.8 V
250 mm/s	≈ 2.1 V
500 mm/s	≈ 2.5 V

2.6.3 DC MOTOR CONT Section

This section is used to eliminate slack in the paper caused by inertia during rewind of roll paper, or when fast forward is stopped. The DC motor is a constant-current-drive type.

2.6.4 TIMER CONT

This uses a 4-bit CPU containing a Graphtec-specification program, and a μPD554C-015. Outputs 2, 3, 4, and 5 always output 1S, 10S, 1M, and 10M, respectively, in sequence (while paper is being fed and the heat switch is on).

When the heat switch is off, pin 26 goes to +5 V (reset), and output is stopped.

2.6.5 Beeper Circuit

This oscillation circuit is shown in the diagram below. It generates a beeper tone when the pen lift lever is raised, or when paper runs out. The oscillation frequency at point A is approximately 2.5 kHz.

Oscillation is stopped when the STOP key is pressed.

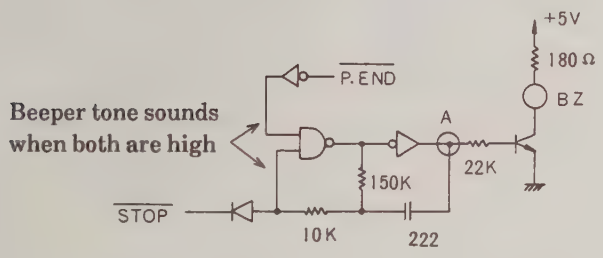


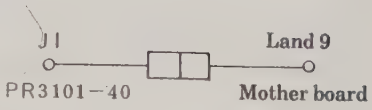
Table of connections to PR3101-40 CHART DRIVER

A	Name	Description	A	Name	Description
1	GND	Logic ground	1	GND	Logic ground
2	+5 V	+5-V regulator power supply	2	+5 V	+5-V regulated voltage
3	1 S	Pulse issued every second, one double pulse issued every ten pulses	3	10 S	Pulse issued every ten seconds, one double pulse for each six pulses
4	1 M	Pulse issued every ten minutes, one double pulse issued every ten pulses	4	10 M	Pulse issued every ten minutes, one double pulse every six pulses
5	$\overline{\text{EXT}}$	Low level when EXT switch is on	5	BD ϕ	Stepping motor D/A
6	AC ϕ	Stepping motor D/A	6	C ϕ	Stepping motor phase switch pulse
7	A ϕ	Stepping motor phase switch pulse	7	D ϕ	Stepping motor phase switch pulse
8	B ϕ	Stepping motor phase switch pulse	8	FV, PULS	Pulse corresponding to deflection of 0.2 mm
9	$\overline{\text{CHRT STP}}$	Low when EXT and CHRT are at STOP	9	TIM RESET	High level when heat is off
10	CHRT CLK	EXT, CHRT clock input	10	HEAT OFF	High level when heat is off
11	P. FEED	Pulse corresponding to deflection of 0.4 mm	11	$\overline{\text{PW}}$	Low level when rewind and paper feed switches are at STOP
12			12	$\overline{\text{PEND}}$	Low level when paper is out or pen is lifted
13	−8 V	−8-V regulator power supply	13	−8 V	−8-V regulated power supply
14	PVMOT	≈ 20-V approx. rectification power supply	14	PVMOT	≈ 20-V unfiltered power supply
15	+8 V	+8-V regulated power supply	15		

Note: PR3101-40 JI (-18 V) is supplied by the mother board 18 V (land 9).

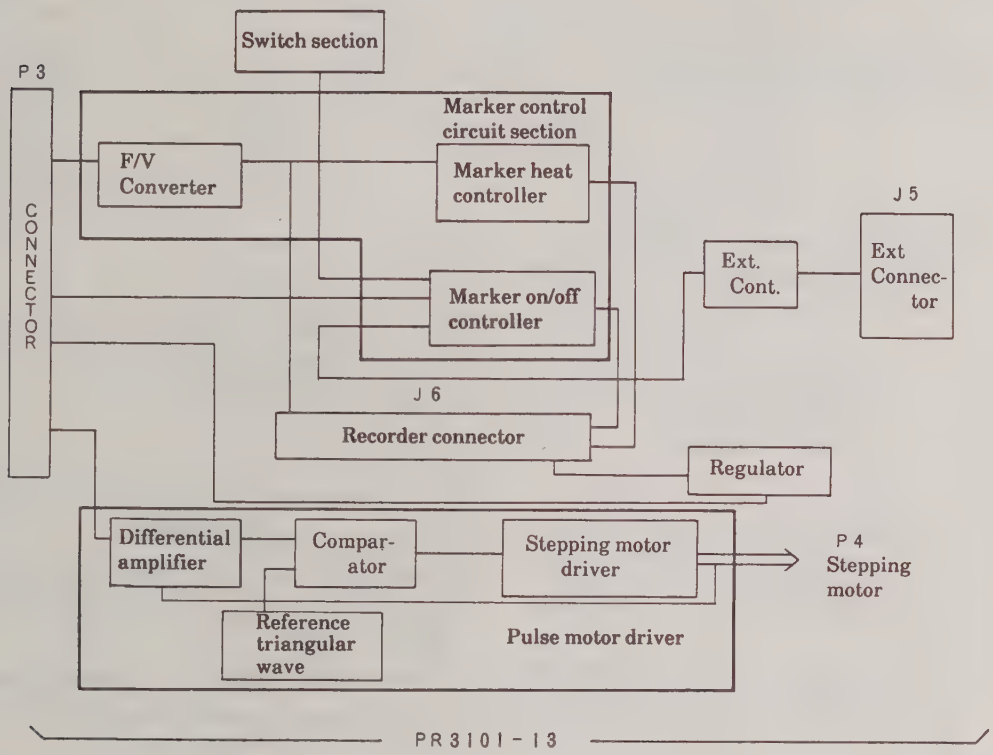
Check LEDs 1 to 3.

LED 1	Extinguished when switch is set to Z-fold paper. Lights when switch is set to roll paper and chart paper is loose; in this situation, speed is not increased above 100 mm/s.
LED 2	Lights once every second, with a double pulse issued every ten times.



2.7 CHART DRIVER

As the diagram below shows, this consists of a marker control circuit section, EXT and IN OUT control section, a pulse motor driver, and connectors to the recorder sections.



2.7.1 Marker Control Circuit

The feed speed clock pulse is converted to a voltage by the F/V converter. It is then added at the amplifier in the marker HEAT CONT section. Table I below shows the relationship between the speed and the output voltage applied to the marker COM pen. The marker is switched on and off at the transistor array μPA2004. The timer is a one-shot type, double pulses are eliminated by the 14538, and pulse width can be varied according to timer setting. The relevant information is given in Table II.

Note

The 14538 is retriggerable, and when a double pulse is generated, 10-s, 1-min, and 10-min pulses are longer by approximately 280 ms.

Table I Relationship between Chart Speed and Marker COM Pen Voltage (TP3)

CHART SPEED	COM voltage
10 mm/s	≈ 8.0 V
100 mm/s	≈ 10.0 V
250 mm/s	≈ 14.5 V
500 mm/s	≈ 17.0 V

Table II Timer Select vs Active Time

TIMER SELECT	ACTIVE TIME
1 s	≈ 250 ms
10 s	≈ 800 ms
1 min	≈ 4.2 s
10 min	≈ 8.2 s

2.7.2 EXT. IN OUT Control

This refers to control of input to and output from external connectors. It is input to internal circuitry via TTL gates and other components. The pulse input pin has an RC filter.

EXT Connector

PIN	Name	IN, OUT, LEVEL	Description
1	$\overline{\text{P. END}}$	OUT LOW ACTIVE	Low output when paper is out or pen is lifted.
2	$\overline{\text{EVNT}}$	IN LOW ACTIVE	Event goes on at low input. ORed with EVNT switch.
3	$\overline{\text{TIM OUT}}$	OUT LOW ACTIVE	Output synced with recorder timing (master)
4	$\overline{\text{TIM IN}}$	IN NEGATIVE EDGE	Timing marker input (slave enabled) enabled with timing switch EXT.
5	$\overline{\text{HEAT}}$	IN LOW ACTIVE	Low when heater is on, ORed with heat switch.
6	CHRT STP	IN HIGH ACTIVE	On when current flows, but STOP switch has priority.
7	CHRT CLK	IN PULSE	Effective when EXT switch is on, 0.025 mm/pulse. Only up to 2 kHz.
8	GND		Logic ground
10	GND		Logic ground
11	GND		Logic ground
12	GND		Logic ground
13	NC		Logic ground
14	+5 V		10 k-Ω output resistance

2.7.3 Stepping Motor Driver

This section is used for vernier drive of the pulse motor. It uses a 1-Ω (3-W) resistor for current detection, and forms a constant-current-type closed loop.

- Differential Amplifier

  This amplifier is used to amplify the difference between the D/A converter output voltage transferred from the chart controller board and the stepping motor current detection resistor voltage.

- Reference Triangular Wave

  This is the reference wave used to keep the switching frequency of the current flowing through the motor coil constant at approximately 20 kHz.

- Comparator

  This compares the output of the differential amplifier with the triangular wave, and establishes the switching time of the current flowing through the motor coil.

- Driver

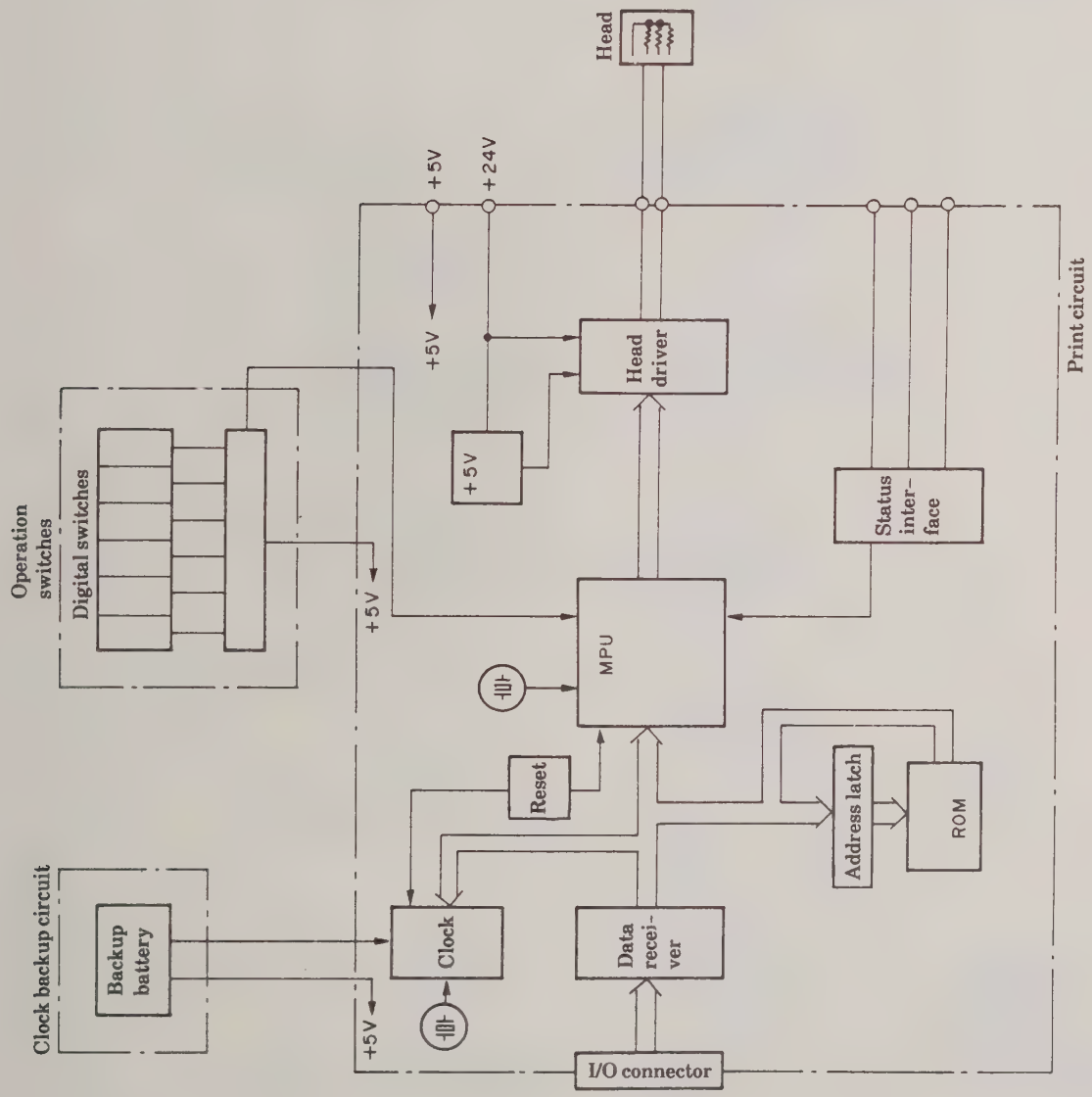
  This is used to drive the current through the motor coil.

2.7.4 Connections to the Main Section

PIN	Name	IN/OUT	Description
A 1	GND		
B 1	GND		
A 2	PVMOT		≈ +20 V, unfiltered power supply
B 2	MVMOT		≈ −20 V, unfiltered power supply
A 3	+5 V		+5 V regulated power supply
B 3	PLV		≈ + 35 V unfiltered power supply
A 4	VF 1	IN :PULSE	Option. V/F unit. Same function as external CHRT clock.
B 4	EXT	OUT:LEVEL	EXT switch. Output is low when off.
A 5	EVNT 1		When EVNT is on, the transistor allowing current to flow to the marker pen goes on.
B 5	EVNT 2		When EVNT is off, the transistor allowing current to flow to the marker pen goes on.
A 6	TIM 1		When TIMING is on, the transistor allowing current to flow to the marker pen goes on.
B 6	MRK C	OUT:LEVEL	Marker applied voltage
A 7	TIM 2		When TIMING is off, the transistor allowing current to flow to the marker pen goes on.
B 7	PRT ON	OUT:LEVEL	Printing is not performed when high.
A 8	PFEED	OUT:PULSE	Pulse corresponding to deflection of 0.4 mm. Used for interval between print dots.
B 8	1 SEC	OUT:PULSE	Print pulse issued every second. Used for EXT feed speed calculation.
A 9	$\overline{\text{HEAT}}$	OUT:LEVEL	Heat goes on when low.
B 9	VCHRT	OUT:LEVEL	Voltage conforming to chart speed, STOP; 0 V→500 mm/s; 1.4 V
A 10	MICRO	OUT:LEVEL	Low when pen is lifted or paper runs out.
B 10	$\overline{\text{PEN STP}}$	OUT:LEVEL	When output is low, pen motor input is 0 V.

2.8 Printer Control Circuitry

The printer control circuitry consists of three PCBs, the controller (MPU) PCB, the operating switch PCB, and the backup battery PCB. The controller consists of the control MPU, the clock, and the print head driver. Power for the clock is supplied from the backup battery. If the backup battery is not connected, printed information will be improper.



3. TROUBLESHOOTING FLOW CHARTS

3.1 Paper Feed Problems

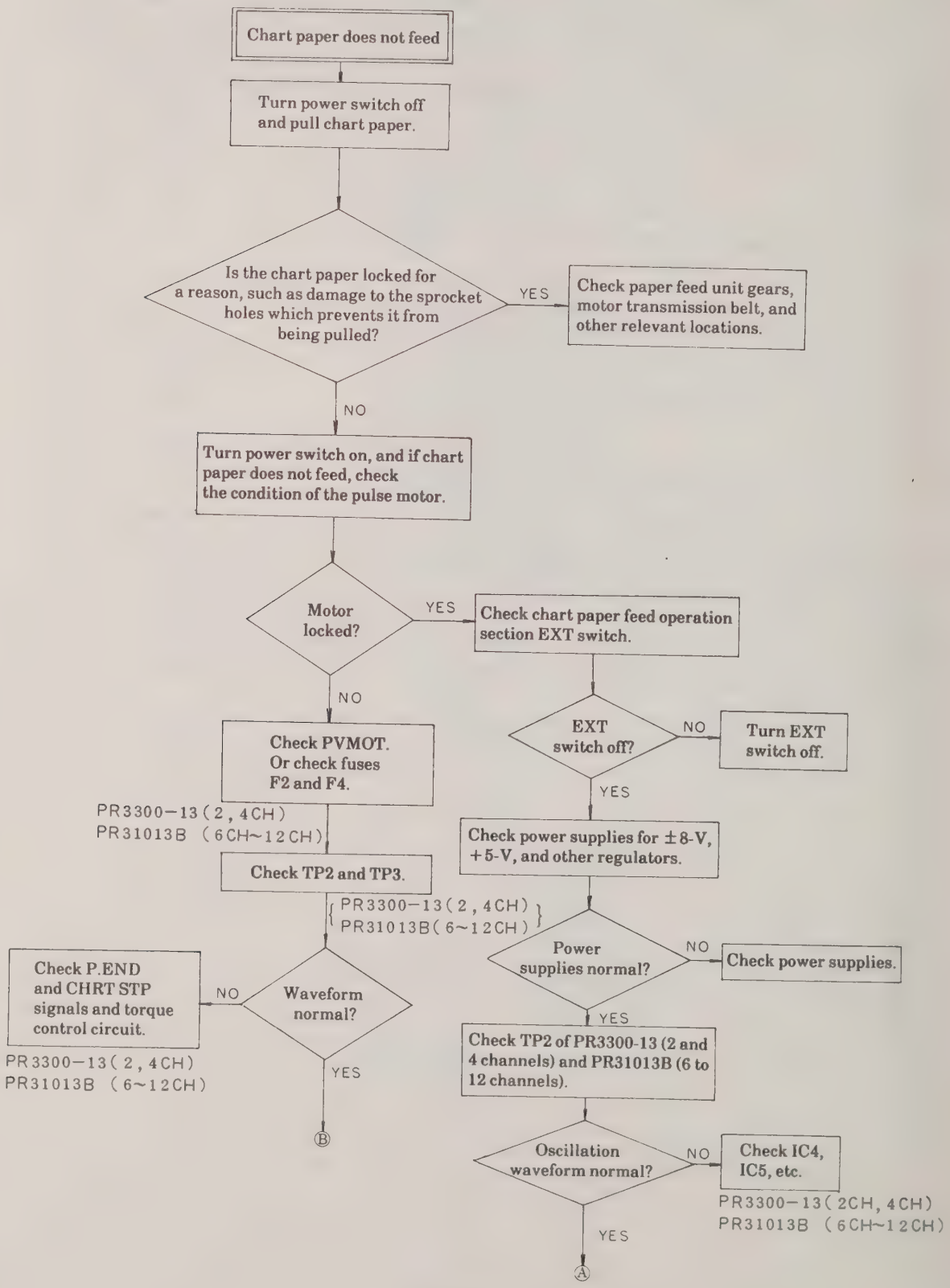
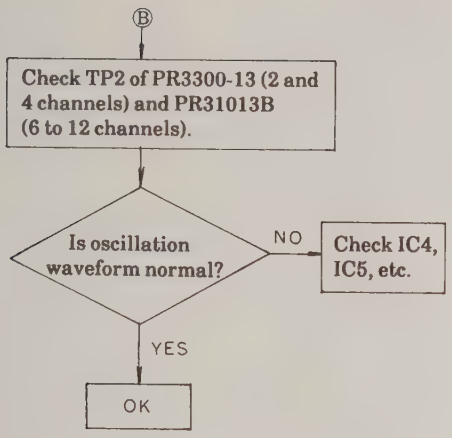
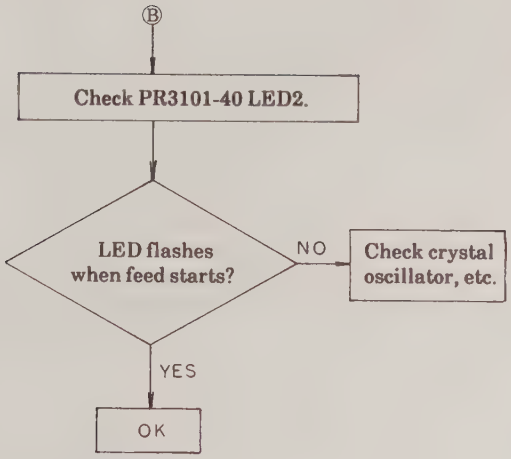
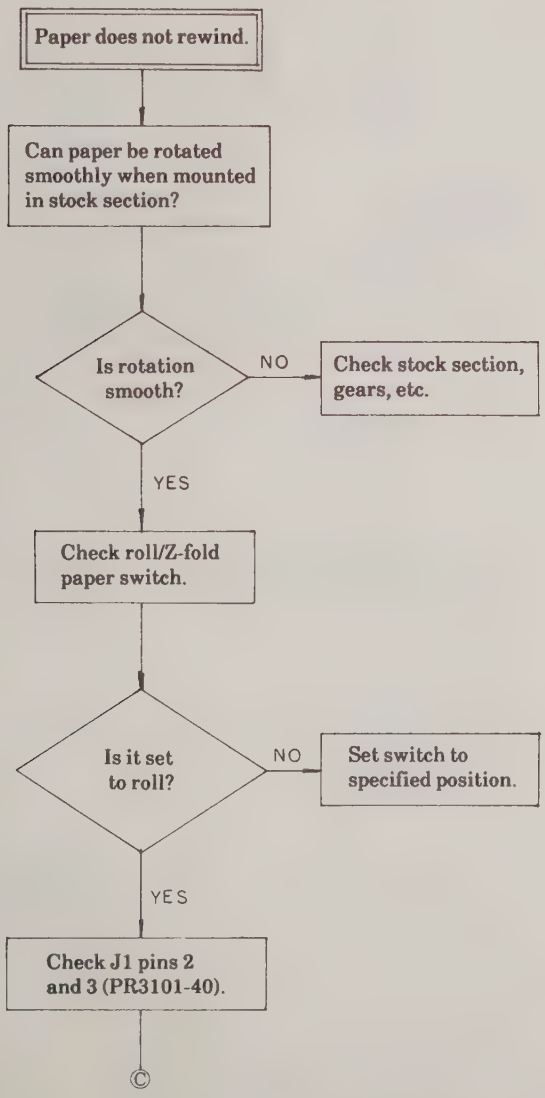
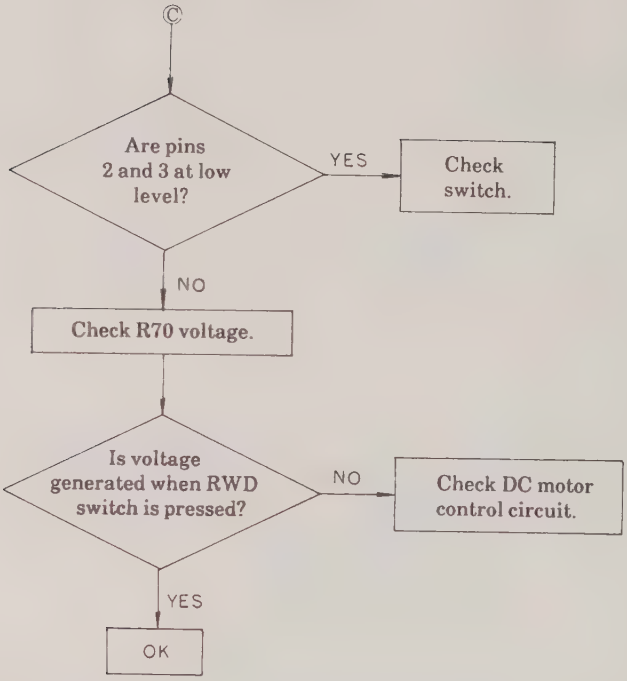


Chart paper does not feed
Turn power switch off and pull chart paper.
Is the chart paper locked for a reason, such as damage to the sprocket holes which prevents it from being pulled?
YES
Check paper feed unit gears, motor transmission belt, and other relevant locations.
NO
Turn power switch on, and if chart paper does not feed, check the condition of the pulse motor.
Motor locked?
YES
Check chart paper feed operation section EXT switch.
NO
Check PVMOT. Or check fuses F2 and F4.
PR3300-13 (2, 4CH)
PR31013B (6CH~12CH)
EXT switch off?
NO
Turn EXT switch off.
YES
Check power supplies for ±8-V, +5-V, and other regulators.
Check TP2 and TP3.
PR3300-13 (2, 4CH)
PR31013B (6~12CH)
Power supplies normal?
NO
Check power supplies.
YES
Check P.END and CHRT STP signals and torque control circuit.
NO
Waveform normal?
PR3300-13 (2, 4CH)
PR31013B (6~12CH)
YES
Ⓑ
Check TP2 of PR3300-13 (2 and 4 channels) and PR31013B (6 to 12 channels).
Oscillation waveform normal?
NO
Check IC4, IC5, etc.
PR3300-13 (2CH, 4CH)
PR31013B (6CH~12CH)
YES
Ⓐ

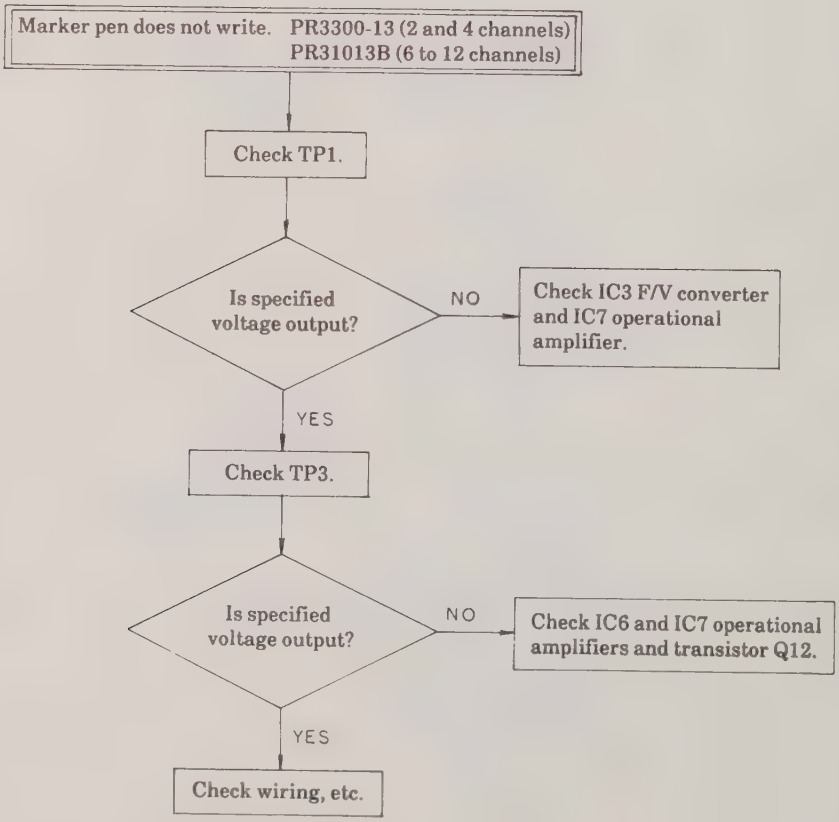

Ⓑ
Check TP2 of PR3300-13 (2 and 4 channels) and PR31013B (6 to 12 channels).
Is oscillation waveform normal?
NO
Check IC4, IC5, etc.
YES
OK

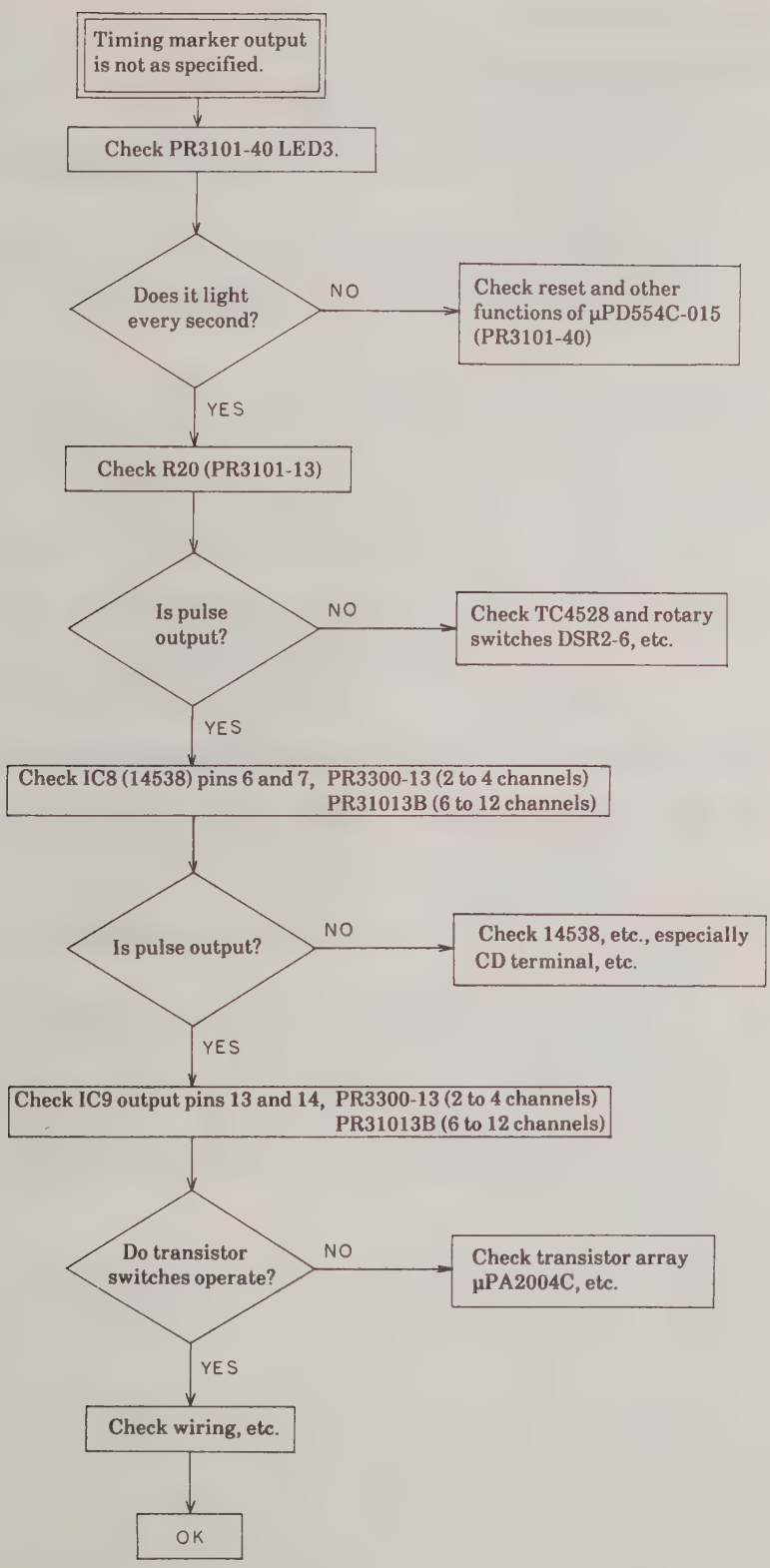

Ⓑ
Check PR3101-40 LED2.
LED flashes when feed starts?
NO
Check crystal oscillator, etc.
YES
OK


Paper does not rewind.
Can paper be rotated smoothly when mounted in stock section?
Is rotation smooth?
NO
Check stock section, gears, etc.
YES
Check roll/Z-fold paper switch.
Is it set to roll?
NO
Set switch to specified position.
YES
Check J1 pins 2 and 3 (PR3101-40).
Ⓒ



3.2 Marker Problems


Marker pen does not write. PR3300-13 (2 and 4 channels) PR31013B (6 to 12 channels)
Check TP1.
Is specified voltage output?
NO
Check IC3 F/V converter and IC7 operational amplifier.
YES
Check TP3.
Is specified voltage output?
NO
Check IC6 and IC7 operational amplifiers and transistor Q12.
YES
Check wiring, etc.


Timing marker output is not as specified.
Check PR3101-40 LED3.
Does it light every second?
NO
Check reset and other functions of μPD554C-015 (PR3101-40)
YES
Check R20 (PR3101-13)
Is pulse output?
NO
Check TC4528 and rotary switches DSR2-6, etc.
YES
Check IC8 (14538) pins 6 and 7, PR3300-13 (2 to 4 channels) PR31013B (6 to 12 channels)
Is pulse output?
NO
Check 14538, etc., especially CD terminal, etc.
YES
Check IC9 output pins 13 and 14, PR3300-13 (2 to 4 channels) PR31013B (6 to 12 channels)
Do transistor switches operate?
NO
Check transistor array μPA2004C, etc.
YES
Check wiring, etc.
OK

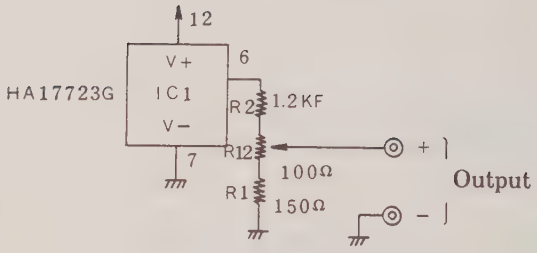
4. ADJUSTMENTS

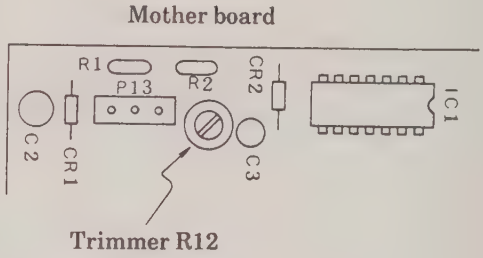
4.1 Recorder Adjustments

- Reference Voltage Output VREF (1 V ±0.2%)

  (1) Remove the panel of the event marker section on the recorder.

  (2) Turn the trimmer R12 on the mother board to set the voltage between the VREF (+) and (−) pins in the range 1 V ±0.2%.





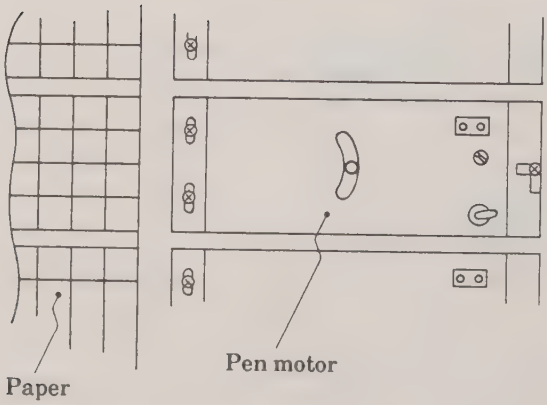
The output resistance of the VREF output is approximately 200 Ω.

4.2 Mounting Pen Motor and Pen Perpendicularity Adjustment

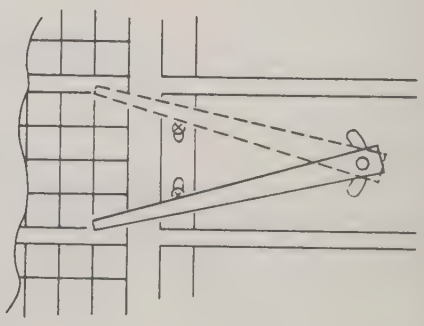
(1) Mount the pen motor onto the recorder using the three screws so that the reference line on the chart paper and the pen motor side panel are parallel.

(2) Temporarily secure the pen onto the pen motor shaft using the set screw.

(3) Move the pen to left and right manually, and visually check the perpendicularity with respect to the chart paper scale. If it is not correct, loosen the set screw, and readjust the pen mounting position. At the same time check the effective stroke. Pen pressure should be 20 g ±3 g for both GS and GW types.



Mounting Pen Motor



Pen perpendicularity

4.3 Regulator Adjustment (±15 V ± 0.2%)

The regulator circuit is mounted on the servo motor board.

(1) Remove the servo amplifier unit from the bottom of the recorder.

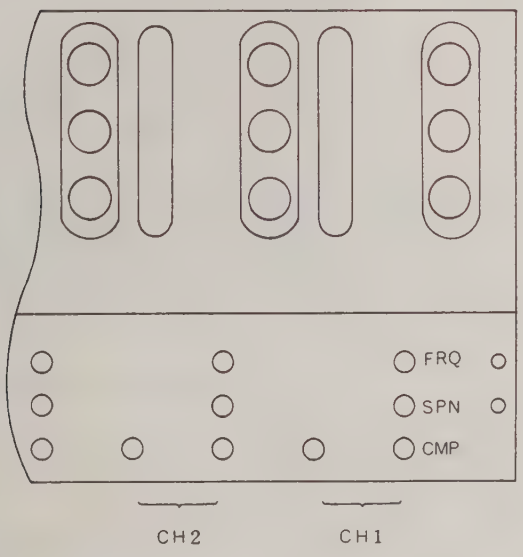
(2) Connect the servo amplifier board to the mother board via the extender card.

(3) Turn servo amplifier board trimmer R6 (VREF) to adjust to +15 V.

Since the −15 V is generated from +15 V using an inverter, adjusting +15 V will bring the −15 V to within ±0.2% of the target value.

The ±15-V measurement location is the preamplifier connector J8 terminal.

Thus, adjustment is performed by removing the preamplifier for the channel requiring adjustment.
+15 V → J8 pin B6
−15 V → J8 pin B5
The input terminal (−) pin (0 V) is the reference.

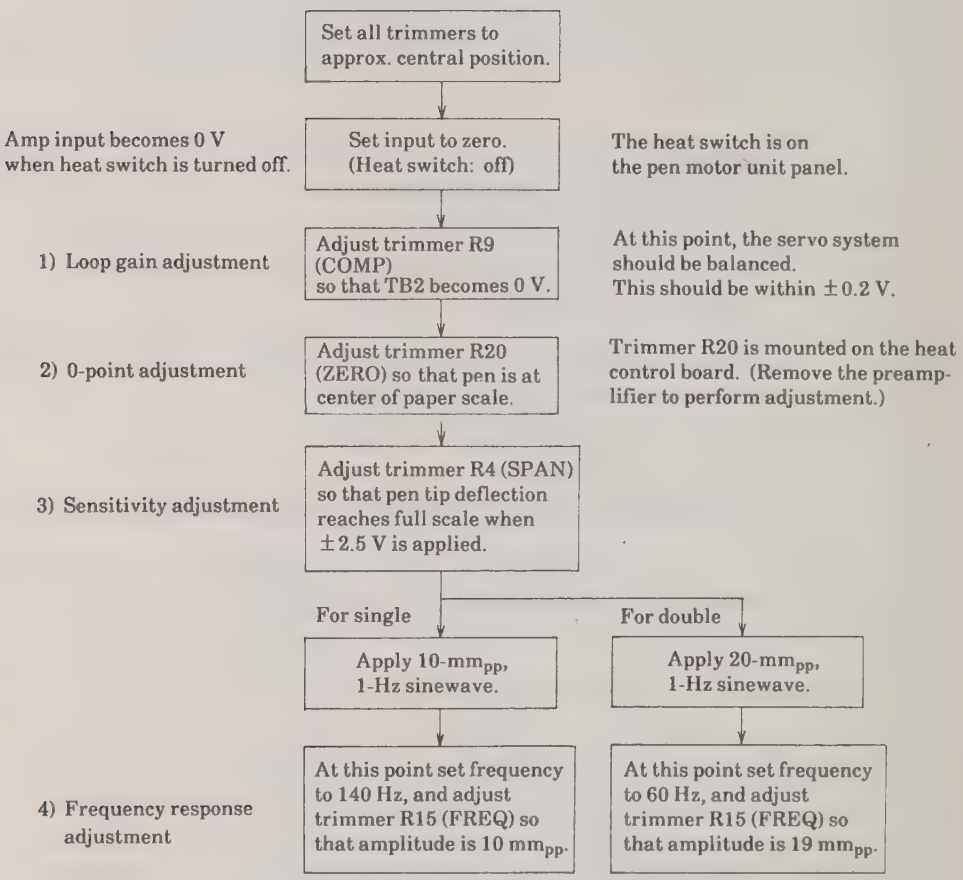


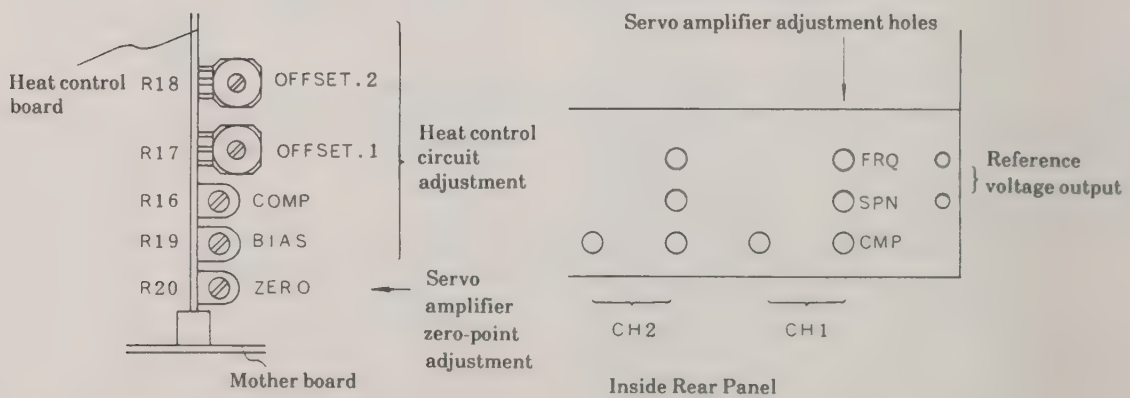
} Reference voltage output (+1 V)

Inside Rear Cover

4.4 Servo Amplifier Adjustment

There are four trimmers used for servo system adjustments. One of them is used for zero adjustment of the bias voltage applied to the potentiometer, and it is mounted on the pen motor unit heat control board.


Set all trimmers to approx. central position.
Amp input becomes 0 V when heat switch is turned off.
Set input to zero. (Heat switch: off)
The heat switch is on the pen motor unit panel.
1) Loop gain adjustment
Adjust trimmer R9 (COMP) so that TB2 becomes 0 V.
At this point, the servo system should be balanced. This should be within ±0.2 V.
2) 0-point adjustment
Adjust trimmer R20 (ZERO) so that pen is at center of paper scale.
Trimmer R20 is mounted on the heat control board. (Remove the preamplifier to perform adjustment.)
3) Sensitivity adjustment
Adjust trimmer R4 (SPAN) so that pen tip deflection reaches full scale when ±2.5 V is applied.
For single
For double
Apply 10-mmpp, 1-Hz sinewave.
Apply 20-mmpp, 1-Hz sinewave.
4) Frequency response adjustment
At this point set frequency to 140 Hz, and adjust trimmer R15 (FREQ) so that amplitude is 10 mmpp.
At this point set frequency to 60 Hz, and adjust trimmer R15 (FREQ) so that amplitude is 19 mmpp.



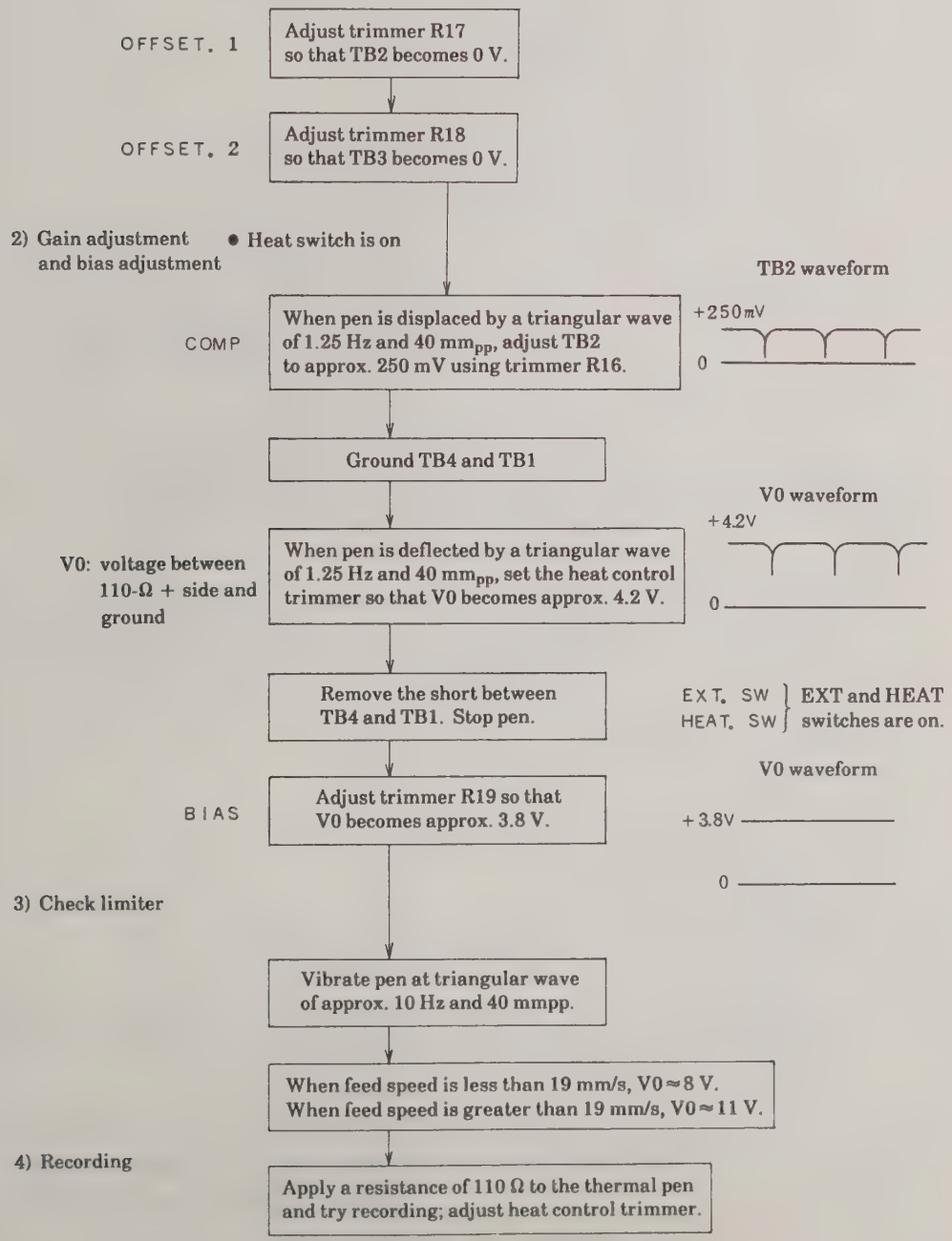
4.5 Heat Control Circuit Adjustment (Common to Both GS and GW Types)

- The reference for all potential differences is TB1 (ground).
- When performing adjustment remove the thermal pen and in its place mount a 110-Ω (2-W) resistor.

(1) Offset Adjustment

Turn the heat switch (PMTR switch) off.

Set the chart feed speed signal VCHRT to 0 V (press STOP switch).


OFFSET. 1
Adjust trimmer R17 so that TB2 becomes 0 V.
OFFSET. 2
Adjust trimmer R18 so that TB3 becomes 0 V.
2) Gain adjustment and bias adjustment
• Heat switch is on
TB2 waveform
COMP
When pen is displaced by a triangular wave of 1.25 Hz and 40 mmpp, adjust TB2 to approx. 250 mV using trimmer R16.
+250mV
0
Ground TB4 and TB1
V0 waveform
+4.2V
V0: voltage between 110-Ω + side and ground
When pen is deflected by a triangular wave of 1.25 Hz and 40 mmpp, set the heat control trimmer so that V0 becomes approx. 4.2 V.
0
Remove the short between TB4 and TB1. Stop pen.
EXT. SW
HEAT. SW
EXT and HEAT switches are on.
V0 waveform
BIAS
Adjust trimmer R19 so that V0 becomes approx. 3.8 V.
+3.8V
0
3) Check limiter
Vibrate pen at triangular wave of approx. 10 Hz and 40 mmpp.
When feed speed is less than 19 mm/s, V0≈8 V.
When feed speed is greater than 19 mm/s, V0≈11 V.
4) Recording
Apply a resistance of 110 Ω to the thermal pen and try recording; adjust heat control trimmer.

4.6 Preamplifier Adjustment

1) Balance adjustment (BAL. 2 trimmer is not attached to L amplifier)

Set all trimmers to approx. central position.

↓

Turn input switch off. Set multiply to mV.

↓

BAL. 1 — Adjust trimmer R12 (BAL. 1) so that pen position at maximum sensitivity comes to pen position at minimum sensitivity.

↓

Set input switch to MEAS. (input open)

↓

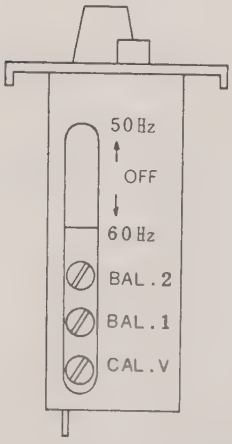
BAL. 2 — Adjust trimmer R6 (BAL. 2) so that pen position at MEAS comes to the pen position when off.

2) Gain adjustment

For single	For double
Set range to 500 mV/cm, and pen to center (reference line).	Set range to 250 mV/cm, and pen to center (reference line).
GAIN (panel) — When 1 V is applied, adjust gain trimmer for a pen deflection of 20 mm.	When 1 V is applied, adjust gain trimmer for a pen deflection of 40 mm.

3) Calibration voltage adjustment

For single	For double
With the pen set to the center (reference line), and input switch set to CAL. V, adjust trimmer R24 (CAL. V) for a pen deflection of 20 mm.	With the pen set to the center (reference line), and input switch set to CAL. V, adjust trimmer R24 (CAL. V) for a pen deflection of 40 mm.



H Amplifier Trimmer Adjustment Panel

Notes

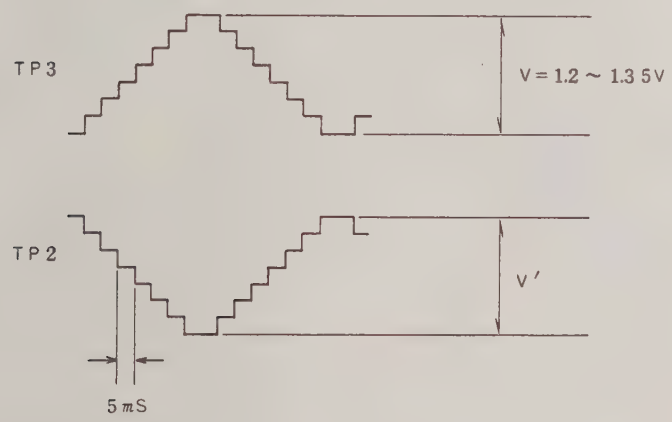
1. Adjust BAL.1 if the pen tip moves (more than 0.3 mm) when the range is switched.
2. Adjust BAL.2 if the pen tip moves (more than 0.3 mm) when the multiply switch is switched.

4.7 Paper Feed Circuit Adjustment (Pen motor heat switches for all channels should be off; and the marker connector should be removed in advance.)

Disconnect connectors J1 (for DC motor and other components) and J4 (pulse motor) from the recorder to perform the following adjustments.

1. PR3101-40 (controller) TP2 and TP3 readjustments (TP1 (ground) is reference)

   This adjustment is performed with the feed speed at 5 mm/s.

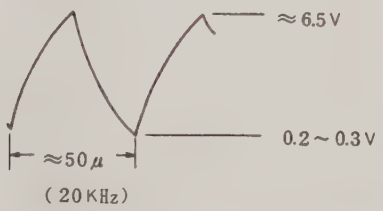


   Adjust VR1 so that V' and V are equal.

2. Readjustment of TP1, TP2, and TP3 (ground is reference) of PR3300-13 (2, 4 channels) and PR31013B (6 to 12 channels) (drivers)

   TP1: Adjust VR2 to 0 V with the STOP switch on.

   TP2: With VR1 at low level, adjust it to within 0.2 to 0.3 V.



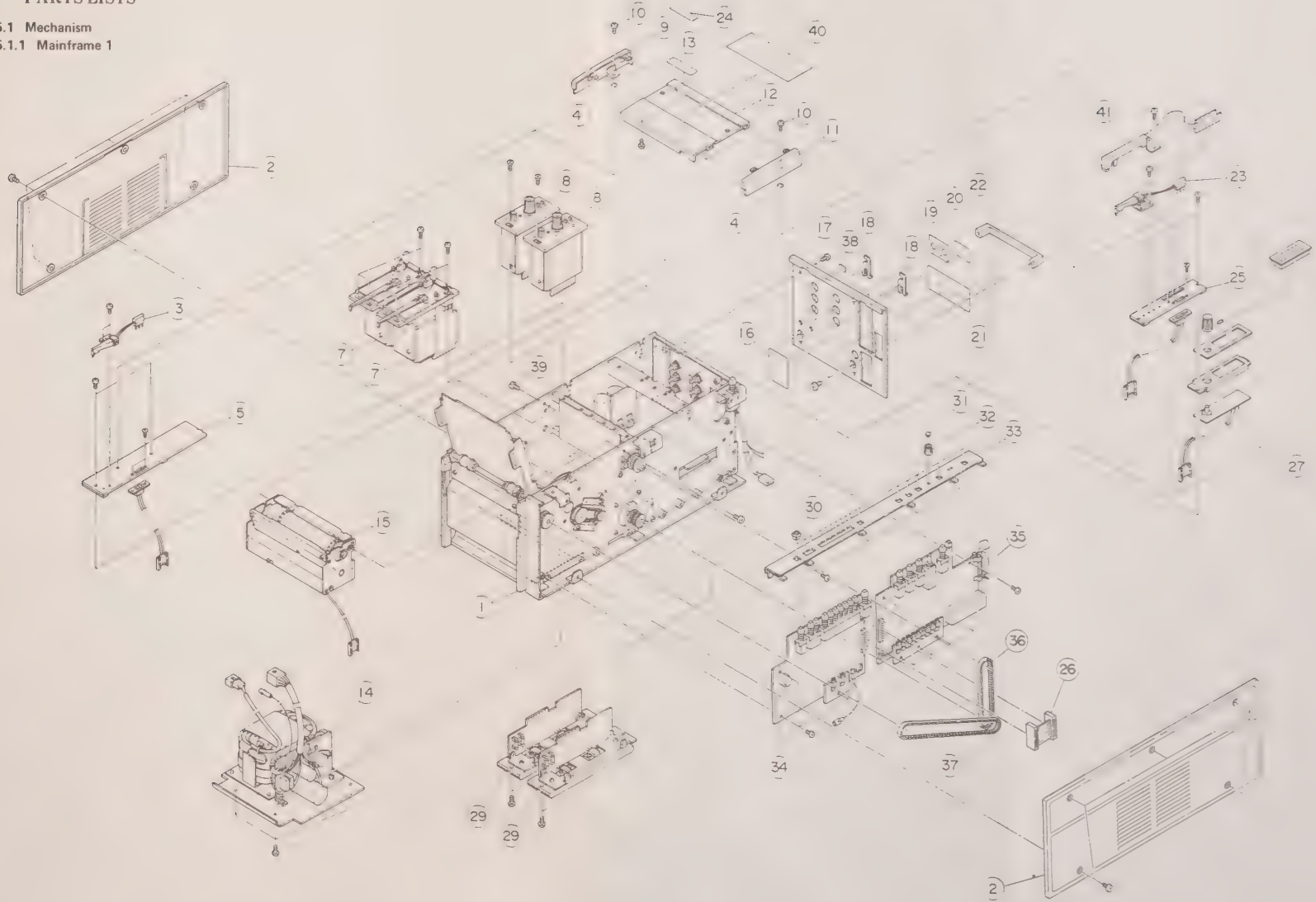
   TP3: With the feed speed at 10 mm/s, adjust VR3 so that TP3 becomes x 8 V.

   Once the above adjustments have been completed, turn the power switch off and connect all connectors.

5. PARTS LISTS

5.1 Mechanism

5.1.1 Mainframe 1



Mainframe 1, 2 Channels

(1/2)

Item	Part No.	Description	Q'ty	Remarks
1		Mainframe 2, 2-ch	1	
2	033005010	Side Cover	2	
3	933101201	Hot Stylus, KT203	1	
4			2	
5	033005210	Side Panel A, Marker	1	
7		Pen Motor Unit GS3310	2	Single
		" GW3310	(1)	Wide
8		Preamplifier AL3301	2	Single L Type
		" AL3302	(1)	Wide L Type
		" AH3301	(2)	Single H Type
		" AH3302	(1)	Wide H Type
		" AZ3301	(2)	Single Z Type
		" AZ3302	(1)	Wide Z Type
9	033005160	Pen Cover Assembly L	1	
10	031000360	Pen Cover Screw	2	
11	033005170	Pen Cover Assembly R	1	
12	033005310	Pen Cover, 2-ch	1	
13	031018091	Caution Plate	1	English
14		Power Unit, 2-ch	1	
15		Chart Drive Mechanism, 2-ch	1	
16	031019800	Name Plate, Heat Control	1	
17	033005510	Rear Cover, 2-ch	1	
18	004407010	Shorting Bar	2	
19	031019880	Name Plate	1	
20	006410590	Name Plate, 500V DC	1	
21	031019670	Name Plate, EXT. CONT.	1	
22	303101060	Handle	1	
23	933101212	Hot Stylus, KT209	1	
24	033005240	Name Plate	1	
25	033005110	Support, Print Head	1	
26	520110060	Flat Cable	1	
27	773300016	Printer Control Unit	1	
29		Servo Amplifier Unit SSA3310	2	Single
		" WSA3310	(1)	Wide
30	508201007	Protective Frame, 1P-10	16	
31	516100018	Cap, 040-162	1	
32	516100016	Knob, 021-222	1	
33	033005410	Control Panel, 3300	1	
34	771310198	Chart Control Board	1	
35	773300003	Chart Drive Board, 2-4	1	
36	373101020	Synchro Belt, 112MxL6.4	1	
37	373101010	Synchro Belt, 224MxL3.2	1	
38	031019520	Channel Sheet, Ch 1	1	
	031019530	" Ch 2	1	
39	031012100	Screw	2	

Mainframe 1, 2 Channels

(2/2)

Item	Part No.	Description	Q'ty	Remarks
40	031013800	Writing Sheet, 2-ch	1	
41	771310185	Print Head	1	KT208

Mainframe 1, 4 Channels

(1/2)

Item	Part No.	Description	Q'ty	Remarks
1		Mainframe 2, 4-ch	1	
2	033005010	Side Cover	2	
3	933101201	Hot Stylus, KT203	1	
4			2	
5	033005210	Side Panel A, Marker	1	
7		Pen Motor Unit GS3310	4	Single
		" GW3310	(2)	Wide
8		Preamplifier AL3301	4	Single L Type
		" AL3302	(2)	Wide L Type
		" AH3301	(4)	Single H Type
		" AH3302	(2)	Wide H Type
		" AZ3301	(4)	Single Z Type
		" AZ3302	(2)	Wide Z Type
9	033005160	Pen Cover Assembly L	1	
10	031000360	Pen Cover Screw	2	
11	033005170	Pen Cover Assembly R	1	
12	033005320	Pen Cover, 4-ch	1	
13	031018091	Caution Plate	1	English
14		Power Unit, 4-ch	1	
15		Chart Drive Mechanism, 4-ch	1	
16	031019800	Name Plate, Heat Control	1	
17	033005520	Rear Cover, 4-ch	1	
18	004407010	Shorting Bar	4	
19	031019660	Name Plate	1	
20	006410590	Name Plate, 500V DC	1	
21	031019670	Name Plate, EXT. CONT.	1	
22	303101060	Handle	1	
23	933101212	Hot Stylus, KT209	1	
24	033005240	Name Plate	1	
25	033005110	Support, Print Head	1	
26	520110060	Flat Cable	1	
27	773300016	Printer Control Unit	1	
29		Servo Amplifier Unit SSA3310	4	Single
		" WSA3310	(2)	Wide
30	508201007	Protective Frame, 1P-10	16	
31	516100018	Cap, 040-162	1	
32	516100016	Knob, 021-222	1	
33	033005410	Control Panel, 3300	1	
34	771310198	Chart Control Board	1	
35	773300003	Chart Drive Board, 2-4	1	
36	373101020	Synchro Belt, 112MxL6.4	1	
37	373101010	Synchro Belt, 224MxL3.2	1	
38	031019520	Channel Sheet, Ch 1	1	
	031019530	" Ch 2	1	
	031019540	" Ch 3	1	

Mainframe 1, 4 Channels

(2/2)

Item	Part No.	Description	Q'ty	Remarks
38	031019550	Channel Sheet, Ch 4	1	
39	031012100	Screw	2	
40	031013810	Writing Sheet, 4-ch	1	
41	771310185	Print Head	1	KT208

Mainframe 1, 6 Channels

(1/2)

Item	Part No.	Description	Q'ty	Remarks
1		Mainframe 2, 6-ch	1	
2	033005010	Side Cover	2	
3	933101201	Hot Stylus, KT203	1	
4			2	
5	033005210	Side Panel A, Marker	1	
7		Pen Motor Unit GS3310	6	Single
		" GW3310	(3)	Wide
8		Preamplifier AL3301	6	Single L Type
		" AL3302	(3)	Wide L Type
		" AH3301	(6)	Single H Type
		" AH3302	(3)	Wide H Type
		" AZ3301	(6)	Single Z Type
		" AZ3302	(3)	Wide Z Type
9	033005160	Pen Cover Assembly L	1	
10	031000360	Pen Cover Screw	2	
11	033005170	Pen Cover Assembly R	1	
12	033005330	Pen Cover, 6-ch	1	
13	031018091	Caution Plate	1	English
14		Power Unit, 6-ch	1	
15		Chart Drive Mechanism, 6-ch	1	
16	031019800	Name Plate, Heat Control	1	
17	033005530	Rear Cover, 6-ch	1	
18	004407010	Shorting Bar	6	
19	031019660	Name Plate	1	
20	006410590	Name Plate, 500V DC	1	
21	031019670	Name Plate, EXT. CONT.	1	
22	303101060	Handle	2	
23	933101212	Hot Stylus, KT209	1	
24	033005240	Name Plate	1	
25	033005110	Support, Print Head	1	
26	520110060	Flat Cable	1	
27	773300016	Printer Control Unit	1	
29		Servo Amplifier Unit SSA3310	6	Single
		" WSA3310	(3)	Wide
30	508201007	Protective Frame, 1P-10	16	
31	516100018	Cap, 040-162	1	
32	516100016	Knob, 021-222	1	
33	033005410	Control Panel, 3300	1	
34	771310198	Chart Control Board	1	
35	773300004	Chart Drive Board, 6-12	1	
36	373101020	Synchro Belt, 112MxL6.4	1	
37	373101010	Synchro Belt, 224MxL3.2	1	
38	031019520	Channel Sheet, Ch 1	1	
	031019530	" Ch 2	1	
	031019540	" Ch 3	1	

Mainframe 1, 6 Channels

(2/2)

Item	Part No.	Description	Q'ty	Remarks
38	031019550	Channel Sheet, Ch 4	1	
	031019560	" Ch 5	1	
	031019570	" Ch 6	1	
39	031012100	Screw	2	
40	031013820	Writing Sheet, 6-ch	1	
41	771310185	Print Head	1	KT208

Mainframe 1, 8 Channels

(1/2)

Item	Part No.	Description	Q'ty	Remarks
1		Mainframe 2, 8-ch	1	
2	033005010	Side Cover	2	
3	933101201	Hot Stylus, KT203	1	
4			2	
5	033005220	Side Panel B, Marker	1	
7		Pen Motor Unit GS3310	8	Single
		" GW3310	(4)	Wide
8		Preamplifier AL3301	8	Single L Type
		" AL3302	(4)	Wide L Type
		" AH3301	(8)	Single H Type
		" AH3302	(4)	Wide H Type
		" AZ3301	(8)	Single Z Type
		" AZ3302	(4)	Wide Z Type
9	033005160	Pen Cover Assembly L	1	
10	031000360	Pen Cover Screw	2	
11	033005170	Pen Cover Assembly R	1	
12	033005340	Pen Cover, 8-ch	1	
13	031018091	Caution Plate	1	English
14		Power Unit, 8-ch	1	
15		Chart Drive Mechanism, 8-ch	1	
16	031019800	Name Plate, Heat Control	1	
17	033005540	Rear Cover, 8-ch	1	8-ch
18	004407010	Shorting Bar	8	
19	031019660	Name Plate, B	1	
20	006410590	Name Plate, 500V DC	1	
21	031019670	Name Plate, EXT. CONT.	1	
22	303101060	Handle	2	
23	933101212	Hot Stylus, KT209	1	
24	033005240	Name Plate	1	
25	033005110	Support, Print Head	1	
26	520110060	Flat Cable	1	
27	773300016	Printer Control Unit	1	
29		Servo Amplifier Unit SSA3310	8	Single
		" WSA3310	(4)	Wide
30	508201007	Protective Frame, 1P-10	16	
31	516100018	Cap, 040-162	1	
32	516100016	Knob, 021-222	1	
33	033005410	Control Panel, 3300	1	
34	771310198	Chart Control Board	1	
35	773300004	Chart Drive Board, 6-12	1	
36	373101020	Synchro Belt, 112MxL6.4	1	
37	373101010	Synchro Belt, 224MxL3.2	1	
38	031019520	Channel Sheet, Ch 1	1	
	031019530	" Ch 2	1	
	031019540	" Ch 3	1	

Mainframe 1, 8 Channels

(2/2)

Item	Part No.	Description	Q'ty	Remarks
38	031019550	Channel Sheet, Ch 4	1	
	031019560	" Ch 5	1	
	031019570	" Ch 6	1	
	031019580	" Ch 7	1	
	031019590	" Ch 8	1	
39	031012100	Screw	2	
40	031013830	Writing Sheet, 8-ch	1	
41	771310185	Print Head	1	KT208

Mainframe 1, 12 Channels

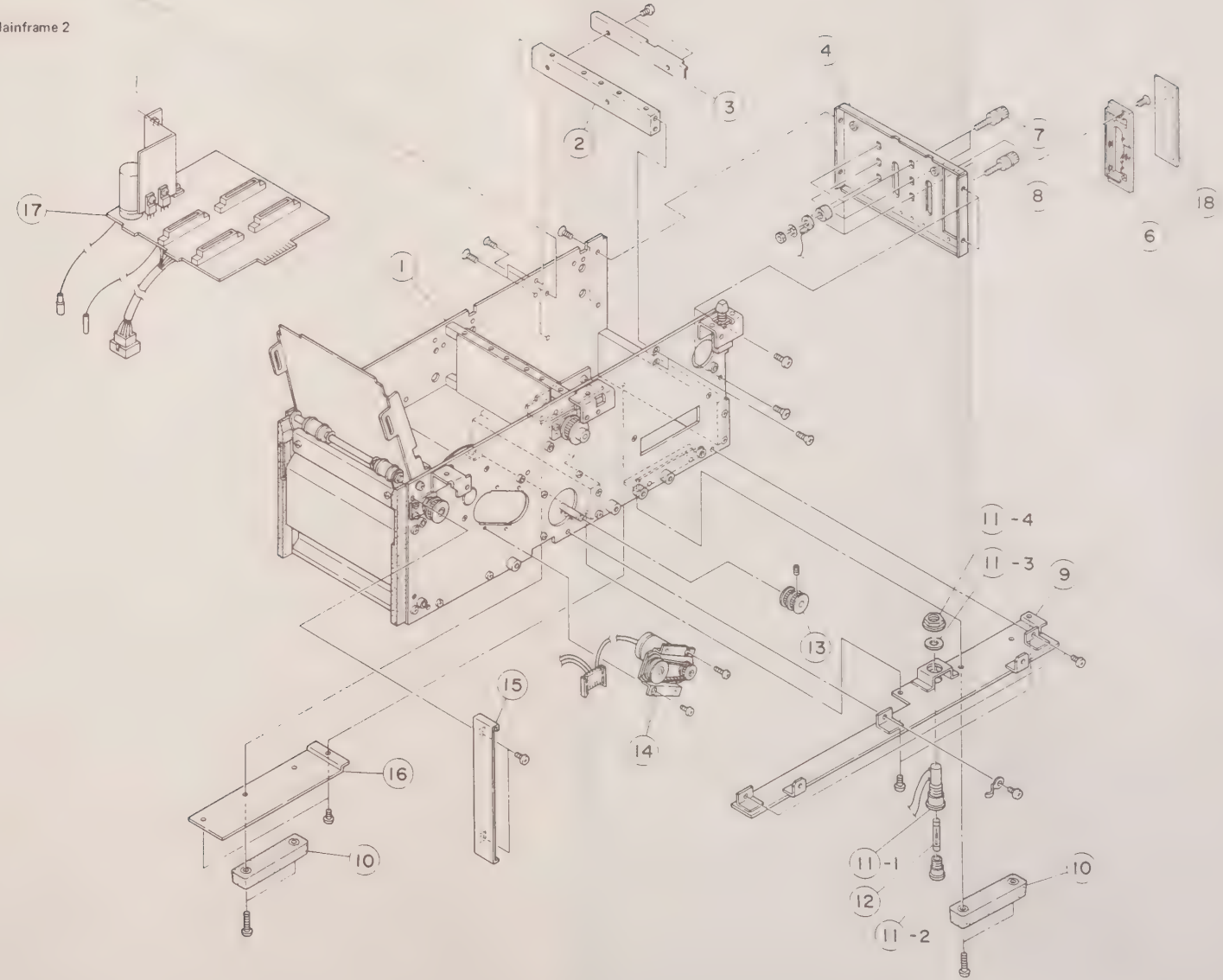
(1/2)

Item	Part No.	Description	Q'ty	Remarks
1		Mainframe 2, 12-ch	1	
2	033005010	Side Cover	2	
3	933101201	Hot Stylus, KT203	1	
4			2	
5	033005210	Side Panel A, Marker	1	
7		Pen Motor Unit GS3310	12	Single
		" GW3310	(6)	Wide
8		Preamplifier AL3301	12	Single L Type
		" AL3302	(6)	Wide L Type
		" AH3301	(12)	Single H Type
		" AH3302	(6)	Wide H Type
		" AZ3301	(12)	Single Z Type
		" AZ3302	(6)	Wide Z Type
9	033005160	Pen Cover Assembly L	1	
10	031000360	Pen Cover Screw	2	
11	033005170	Pen Cover Assembly R	1	
12	033005350	Pen Cover, 12-ch	1	
13	031018091	Caution Plate	1	English
14		Power Unit, 12-4	1	
		Power Unit, 12-8	1	
15		Chart Drive Mechanism, 12-ch	1	
16	031019800	Name Plate, Heat Control	1	
17	033005550	Rear Cover, 12-ch	1	
18	004407010	Shorting Bar	12	
19	031019660	Name Plate	1	
20	006410590	Name Plate, 500V DC	1	
21	031019670	Name Plate, EXT. CONT.	1	
22	303101060	Handle	2	
23	933101212	Hot Stylus, KT209	1	
24	033005240	Name Plate	1	
25	033005110	Support, Print Head	1	
26	520110060	Flat Cable	1	
27	773300016	Printer Control Unit	1	
29		Servo Amplifier Unit SSA3310	12	Single
		" WSA3310	(6)	Wide
30	508201007	Protective Frame, 1P-10	16	
31	516100018	Cap, 040-162	1	
32	516100016	Knob, 021-222	1	
33	033005410	Control Panel, 3300	1	
34	771310198	Chart Control Board	1	
35	773300004	Chart Drive Board, 6-12	1	
36	373101020	Synchro Belt, 112MxL6.4	1	
37	373101010	Synchro Belt, 224MxL3.2	1	
38	031019520	Channel Sheet, Ch 1	1	
	031019530	" Ch 2	1	

Mainframe 1, 12 Channels

(2/2)

Item	Part No.	Description	Q'ty	Remarks
38	031019540	Channel Sheet, Ch 3	1	
	031019550	" Ch 4	1	
	031019560	" Ch 5	1	
	031019570	" Ch 6	1	
	031019580	" Ch 7	1	
	031019590	" Ch 8	1	
	031019600	" Ch 9	1	
	031019610	" Ch 10	1	
	031019620	" Ch 11	1	
	031019630	" Ch 12	1	
39	031012100	Screw	2	
40	031013840	Writing Sheet, 12-ch	1	
41	771310185	Print Head	1	KT208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Mainframe 2, 2 Channels

Item	Part No.	Description	Q'ty	Remarks
1		Mainframe 3, 2-ch	1	
2	031010511	Stay, 2-ch	1	
3	037011050	Preamp Support, 2-ch	1	
4	731010585	Terminal Holder Assembly, 2-ch	1	
6	031018020	Spacer	1	
7	514400010	Terminal, Red	4	
8	514400011	Terminal, Black	2	
9	731010227	Bottom Plate, Right	1	
10	731010310	Cushion	2	
11	512400002	Fuse Holder	1	
12	512300027	Fuse, F102-SGA-4A	1	100V
	512300029	Fuse, F102-SGA-2A	1	200V
13	731016010	Pulley A	1	
14		Rewind Unit Assembly	1	
15	033000010	Front Cover	1	
16	031010392	Bottom Plate, Left B	1	
17	771310113	Mother Board, 2-ch	1	
18	033005060	Printer Connector Panel	1	

Mainframe 2, 4 Channels

Item	Part No.	Description	Q'ty	Remarks
1		Mainframe 3, 4-ch	1	
2	031011064	Stay, 4-ch	1	
3	037011150	Preamp Support, 4-ch	1	
4	731011136	Terminal Holder Assembly, 4-ch	1	
6	031018020	Spacer	1	
7	514400010	Terminal, Red	8	
8	514400011	Terminal, Black	4	
9	731010227	Bottom Plate, Right	1	
10	731010310	Cushion	2	
11	512400002	Fuse Holder	1	
12	512300027	Fuse, F102-SGA-4A	1	100V
	512300029	Fuse, F102-SGA-2A	1	200V
13	731016010	Pulley A	1	
14		Rewind Unit Assembly	1	
15	033000010	Front Cover	1	
16	031010392	Bottom Plate, Left B	1	
17	771310114	Mother Board, 4-ch	1	
18	033005060	Printer Connector Panel	1	

Mainframe 2, 6 Channels

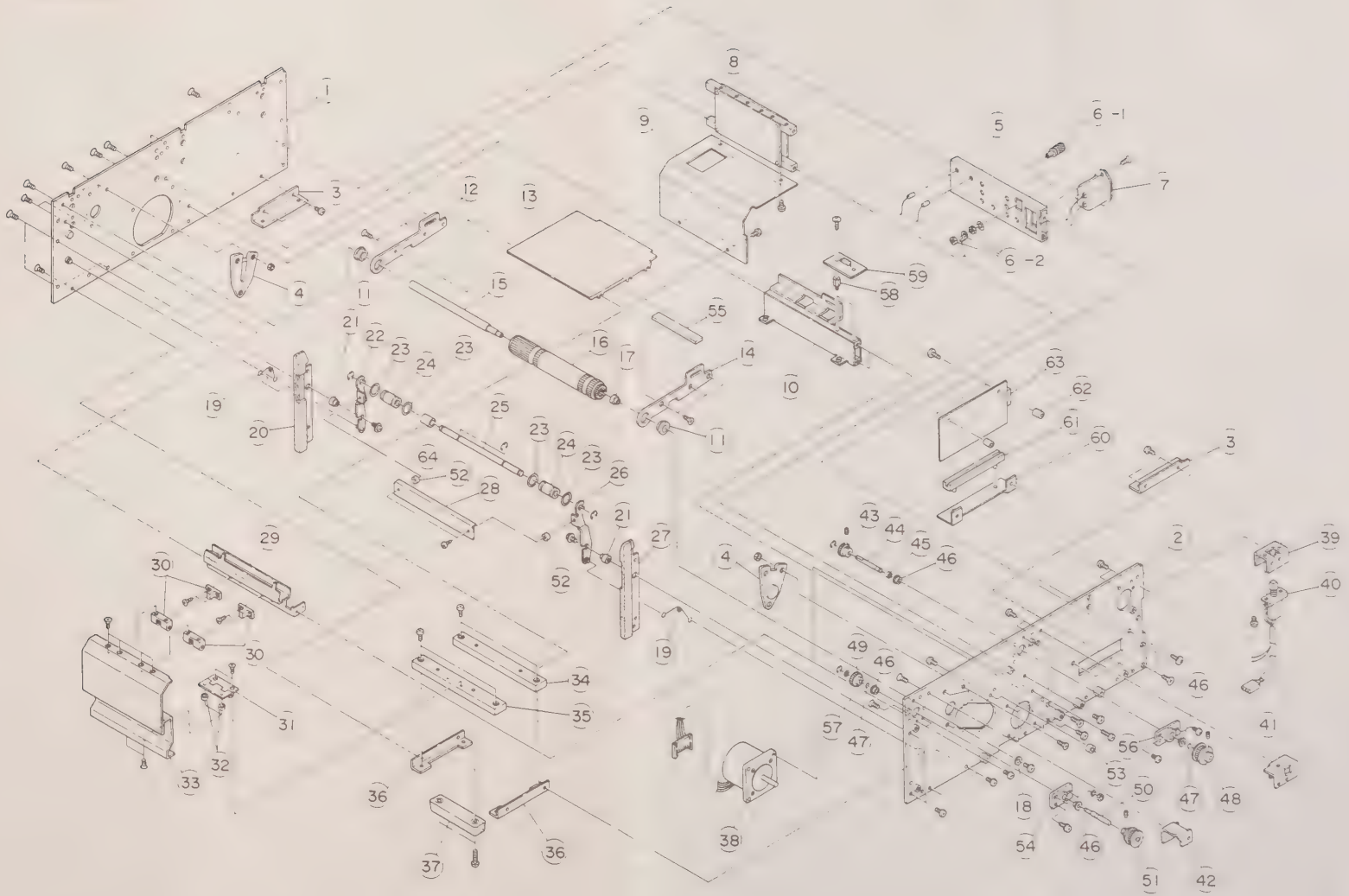
Item	Part No.	Description	Q'ty	Remarks
1		Mainframe 3, 6-ch	1	
2	031011311	Stay, 6-ch	1	
3	037011250	Preamp Support, 6-ch	1	
4	731011384	Terminal Holder Assembly, 6-ch	1	
6	031018020	Spacer	1	
7	514400010	Terminal, Red	12	
8	514400011	Terminal, Black	6	
9	731010227	Bottom Plate, Right	1	
10	731010310	Cushion	2	
11	512400002	Fuse Holder	1	
12	512300027	Fuse, F102-SGA-4A	1	100V
	512300029	Fuse, F102-SGA-2A	1	200V
13	731016010	Pulley A	1	
14		Rewind Unit Assembly	1	
15	033000010	Front Cover	1	
16	031010392	Bottom Plate, Left B	1	
17	771310115	Mother Board, 6-ch	1	
18	033005060	Printer Connector Panel	1	

Mainframe 2, 8 Channels

Item	Part No.	Description	Q'ty	Remarks
1		Mainframe 3, 8-ch	1	
2	031011562	Stay, 8-ch	1	
3	037011350	Preamp Support, 8-ch	1	
4	731011634	Terminal Holder Assembly, 8-ch	1	
6	031018020	Spacer	1	
7	514400010	Terminal, Red	16	
8	514400011	Terminal, Black	8	
9	731010227	Bottom Plate, Right	1	
10	731010310	Cushion	2	
11	512400002	Fuse Holder	1	
12	512300028	Fuse, F102-SGA-6A	1	100V
	512300031	Fuse, F102-SGA-3A	1	200V
13	731016010	Pulley A	1	
14		Rewind Unit Assembly	1	
15	033000010	Front Cover	1	
16	031010286	Bottom Plate, Left A	1	
17	771310116	Mother Board, 8-ch	1	
18	033005060	Printer Connector Panel	1	

Mainframe 2, 12 Channels

Item	Part No.	Description	Q'ty	Remarks
1		Mainframe 3, 12-ch	1	
2	031011813	Stay, 12-ch	1	
3	037011460	Preamp Support, 12-ch	1	
4	731011885	Terminal Holder Assembly, 12-ch	1	
6	031018020	Spacer	1	
7	514400010	Terminal, Red	24	
8	514400011	Terminal, Black	12	
9	731010227	Bottom Plate, Right	1	
10	731010310	Cushion	2	
11	512400002	Fuse Holder	1	
12	512300028	Fuse, F102-SGA-6A	1	100V
	512300031	Fuse, F102-SGA-3A	1	200V
13	731016010	Pulley A	1	
14		Rewind Unit Assembly	1	
15	033000010	Front Cover	1	
16	031010392	Bottom Plate, Left B	1	
17	771310117	Mother Board, 12-ch	1	
18	033005060	Printer Connector Panel	1	



Mainframe 3, 2 Channels

(1/2)

Item	Part No.	Description	Q'ty	Remarks
1	031110142	Side Panel L	1	
2	031110132	Side Panel R	1	
3	031010293	Holder, Cushion	2	
4	031010351	Holder, Stock Bobbin	2	
5	037011062	Rear Stay, 2-ch	1	
6	514400004	Terminal, SQ0204-02	1	
7	518110004	Line Filter, FN323-6101	1	
8	731010471	Main, Stay 1, 2-ch	1	
9	031010463	Partition Panel, 2-ch	1	
10	731010534	Main Stay 2, 2-ch	1	
11	031016320	Spacer, Side Panel B	2	
12	031016300	Side Panel B, L	1	
13	031016401	Writing Panel, 2-ch	1	
14	031016310	Side Panel B, R	1	
15	031016522	Tension Shaft, 2-ch	1	
16	731017754	Tension Drum, 2-ch	1	
17	031017741	Collar, Tension Drum	1	
18	031000590	Spacer, Tension Drum	1	
19	031016294	Cutter Arm Spring	2	
20	731011963	Cushion L	1	
21	031013871	Shaft, Cutter Arm	2	
22	031016431	Cutter Arm L	1	
23	341712010	O-Ring, P-12	4	
24	031016492	Pinch Roller	2	
25	031016484	Pinch Roller Shaft, 2-ch	1	
26	731016001	Cutter Arm R	1	
27	731010333	Cushion, R	1	
28	031016440	Cutter, 2-ch	1	
29	731010663	Guide C, 2-ch	1	
30	303101010	Catch, TL-60-Z-CR	2	
31	031010371	Hinge	1	
32	031010380	Hinge Spacer	2	
33	033000210	Front Panel, 2-ch	1	
34	031010444	Front Stay, B, 2-ch	1	
35	031010424	Front Stay A, 2-ch	1	
36	031010211	Front Stay Holder	2	
37	731010310	Cushion	1	
38	509410001	Motor, KP6R2-011	1	
39	037010051	Power Switch Holder	1	
40	508101010	Power Switch	1	
41	031011995	Support B, Side Cover	1	
42	037010032	Support A, Side Cover	1	
43	067116350	Gear	1	
44	031016082	Drive Shaft A	1	
45	031019930	Spacer	1	

Mainframe 3, 2 Channels

Item	Part No.	Description	Q'ty	Remarks
46	310905050	Ball Bearing, MF95ZZS	6	
47	031014150	Ring	2	
48	731016052	Pulley B	1	
49	031016142	Tension Gear B	1	
50	031016124	Drive Shaft B	1	
51	031114370	Slip Pulley Assembly	1	
52	031016272	Cutter Spacer	2	
53	031011980	Spacer, P.C.B.	1	
54	731010071	Bearing Holder, T	1	
55	031017560	Magnet Rubber	1	
56	731010041	Bearing Holder, S	1	
57	373201003	Clutch, NHF-04	1	
58	303500025	Spacer, SQ-7.5	2	
59	773500116	Printer Control Backup P.C.B.	1	
60	031017700	Holder, Print P.C.B. Guide	1	
61	513400011	P.C.B. Guide, KEL50-6010	1	
62	031017710	Support, Printer P.C.B.	2	
63	773300017	Printer Board, WR3300	1	

Mainframe 3, 4 Channels

(1/2)

Item	Part No.	Description	Q'ty	Remarks
1	031110142	Side Panel L	1	
2	031110132	Side Panel R	1	
3	031010293	Holder, Cushion	2	
4	031010351	Holder, Stock Bobbin	2	
5	037011160	Rear Stay, 4-ch	1	
6	514400004	Terminal, SQ0204-02	1	
7	518110004	Line Filter, FN323-6101	1	
8	731011021	Main, Stay 1, 4-ch	1	
9	031011014	Partition Panel, 4-ch	1	
10	731011082	Main Stay 2, 4-ch	1	
11	031016320	Spacer, Side Panel B	2	
12	031016300	Side Panel B, L	1	
13	031016491	Writing Panel, 4-ch	1	
14	031016310	Side Panel B, R	1	
15	031016622	Tension Shaft, 4-ch	1	
16	731017764	Tension Drum, 4-ch	1	
17	031017741	Collar, Tension Drum	1	
18	031000590	Spacer, Tension Drum	1	
19	031016294	Cutter Arm Spring	2	
20	731011963	Cushion L	1	
21	031013871	Shaft, Cutter Arm	2	
22	031016431	Cutter Arm L	1	
23	341712010	O-Ring, P-12	4	
24	031016492	Pinch Roller	2	
25	031016684	Pinch Roller Shaft, 4-ch	1	
26	731016001	Cutter Arm R	1	
27	731010333	Cushion, R	1	
28	031016640	Cutter, 4-ch	1	
29	731011183	Guide C, 4-ch	1	
30	303101010	Catch, TL-60-Z-CR	2	
31	031010371	Hinge	2	
32	031010380	Hinge Spacer	4	
33	033000220	Front Panel, 4-ch	1	
34	031010994	Front Stay B, 4-ch	1	
35	031010984	Front Stay A, 4-ch	1	
36	031010211	Front Stay Holder	2	
37	731010310	Cushion	2	
38	509410001	Motor, KP6R2-011	1	
39	037010051	Power Switch Holder	1	
40	508101010	Power Switch	1	
41	031011995	Support B, Side Cover	1	
42	037010032	Support A, Side Cover	1	
43	067116350	Gear	1	
44	031016082	Drive Shaft A	1	
45	031019930	Spacer	1	

Mainframe 3, 4 Channels

Item	Part No.	Description	Q'ty	Remarks
46	310905050	Ball Bearing, MF95ZZS	6	
47	031014150	Ring	2	
48	731016052	Pulley B	1	
49	031016142	Tension Gear B	1	
50	031016124	Drive Shaft B	1	
51	031114370	Slip Pulley Assembly	1	
52	031016272	Cutter Spacer	2	
53	031011980	Spacer, P.C.B.	1	
54	731010071	Bearing Holder, T	1	
55	031017570	Magnet Rubber, 4-ch	1	
56	731010041	Bearing Holder, S	1	
57	373201003	Clutch, NHF-04	1	
58	303500025	Spacer, SQ-7.5	2	
59	773500116	Printer Control Backup P.C.B.	1	
60	031017700	Holder, Print P.C.B. Guide	1	
61	513400011	P.C.B. Guide, KEL50-6010	1	
62	031017710	Support, Printer P.C.B.	2	
63	773300017	Printer Board, WR3300	1	

Mainframe 3, 6 Channels

(1/2)

Item	Part No.	Description	Q'ty	Remarks
1	031110142	Side Panel L	1	
2	031110132	Side Panel R	1	
3	031010293	Holder, Cushion	2	
4	031010351	Holder, Stock Bobbin	2	
5	037011260	Rear Stay, 6-ch	1	
6	514400004	Terminal, SQ0204-02	1	
7	518110004	Line Filter, FN323-6101	1	
8	731011272	Main Stay 1, 6-ch	1	
9	033000630	Partition Panel, 6-ch	1	
10	731011333	Main Stay 2, 6-ch	1	
11	031016320	Spacer, Side Panel B	2	
12	031016300	Side Panel B, L	1	
13	031016701	Writing Panel, 6-ch	1	
14	031016310	Side Panel B, R	1	
15	031016722	Tension Shaft, 6-ch	1	
16	731017774	Tension Drum, 6-ch	1	
17	031017741	Collar, Tension Drum	1	
18	031000590	Spacer, Tension Drum	1	
19	031016294	Cutter Arm Spring	2	
20	731011963	Cushion L	1	
21	031013871	Shaft, Cutter Arm	2	
22	031016431	Cutter Arm L	1	
23	341712010	O-Ring, P-12	4	
24	031016492	Pinch Roller	2	
25	031016784	Pinch Roller Shaft, 6-ch	1	
26	731016001	Cutter Arm R	1	
27	731010333	Cushion, R	1	
28	031016740	Cutter, 6-ch	1	
29	731011433	Guide C, 6-ch	1	
30	303101010	Catch, TL-60-Z-CR	2	
31	031010371	Hinge	2	
32	031010380	Hinge Spacer	4	
33	033000230	Front Panel, 6-ch	1	
34	031011244	Front Stay B, 6-ch	1	
35	731011222	Front Stay A, 6-ch	1	
36	031010211	Front Stay Holder	2	
37	731010310	Cushion	2	
38	509200022	Motor, PH-268-21-A8	1	
39	037010051	Power Switch Holder	1	
40	508101010	Power Switch	1	
41	031011995	Support B, Side Cover	1	
42	037010032	Support A, Side Cover	1	
43	067116350	Gear	1	
44	031016082	Drive Shaft A	1	
45	031019930	Spacer	1	

Mainframe 3, 6 Channels

Item	Part No.	Description	Q'ty	Remarks
46	310905050	Ball Bearing, MF95ZZS	6	
47	031014150	Ring	2	
48	731016052	Pulley B	1	
49	031016142	Tension Gear B	1	
50	031016124	Drive Shaft B	1	
51	031114370	Slip Pulley Assembly	1	
52	031016272	Cutter Spacer	2	
53	031011980	Spacer, P.C.B.	1	
54	731010071	Bearing Holder, T	1	
55	031017580	Magnet Rubber, 6-ch	1	
56	731010041	Bearing Holder, S	1	
57	373201003	Clutch, NHF-04	1	
58	303500025	Spacer, SQ-7.5	2	
59	773500116	Printer Control Backup P.C.B.	1	
60	031017700	Holder, Print P.C.B. Guide	1	
61	513400011	P.C.B. Guide, KEL50-6010	1	
62	031017710	Support, Printer P.C.B.	2	
63	773300017	Printer Board, WR3300	1	
64	031018440	Roller	1	

Mainframe 3, 8 Channels

(1/2)

Item	Part No.	Description	Q'ty	Remarks
1	031110142	Side Panel L	1	
2	031110132	Side Panel R	1	
3	031010293	Holder, Cushion	2	
4	031010351	Holder, Stock Bobbin	2	
5	037011361	Rear Stay, 8-ch	1	
6	514400004	Terminal, SQ0204-02	1	
7	518110004	Line Filter, FN323-6101	1	
8	731011521	Main, Stay 1, 8-ch	1	
9	031011514	Partition Panel, 8-ch	1	
10	731011583	Main Stay 2, 8-ch	1	
11	031016320	Spacer, Side Panel B	2	
12	031016300	Side Panel B, L	1	
13	031016801	Writing Panel, 8-ch	1	
14	031016310	Side Panel B, R	1	
15	031016822	Tension Shaft, 8-ch	1	
16	731017784	Tension Drum, 8-ch	1	
17	031017741	Collar, Tension Drum	1	
18	031000590	Spacer, Tension Drum	1	
19	031016294	Cutter Arm Spring	2	
20	731011963	Cushion L	1	
21	031013871	Shaft, Cutter Arm	2	
22	031016431	Cutter Arm L	1	
23	341712010	O-Ring, P-12	4	
24	031016492	Pinch Roller	2	
25	031016886	Pinch Roller Shaft, 8-ch	1	
26	731016001	Cutter Arm R	1	
27	731010333	Cushion, R	1	
28	031016840	Cutter, 8-ch	1	
29	731011682	Guide C, 8-ch	1	
30	303101010	Catch, TL-60-Z-CR	2	
31	031010371	Hinge	2	
32	031010380	Hinge Spacer	4	
33	033000240	Front Panel, 8-ch	1	
34	031011495	Front Stay B, 8-ch	1	
35	031011483	Front Stay A, 8-ch	1	
36	031010211	Front Stay Holder	2	
37	731010310	Cushion	2	
38	509200022	Motor, PH-268-21-A8	1	
39	037010051	Power Switch Holder	1	
40	508101010	Power Switch	1	
41	031011995	Support B, Side Cover	1	
42	037010032	Support A, Side Cover	1	
43	067116350	Gear	1	
44	031016082	Drive Shaft A	1	
45	031019930	Spacer	1	

Mainframe 3, 8 Channels

Item	Part No.	Description	Q'ty	Remarks
46	310905050	Ball Bearing, MF95ZZS	6	
47	031014150	Ring	2	
48	731016052	Pulley B	1	
49	031016142	Tension Gear B	1	
50	031016124	Drive Shaft B	1	
51	031114370	Slip Pulley Assembly	1	
52	031016272	Cutter Spacer	2	
53	031011980	Spacer, P.C.B.	1	
54	731010071	Bearing Holder, T	1	
55	031017590	Magnet Rubber, 8-ch	1	
56	731010041	Bearing Holder, S	1	
57	373201003	Clutch, NHF-04	1	
58	303500025	Spacer, SQ-7.5	2	
59	773500116	Printer Control Backup P.C.B.	1	
60	031017700	Holder, Print P.C.B. Guide	1	
61	513400011	P.C.B. Guide, KEL50-6010	1	
62	031017710	Support, Printer P.C.B.	2	
63	773300017	Printer Board, WR3300	1	
64	031018440	Roller	2	

Mainframe 3, 12 Channels

(1/2)

Item	Part No.	Description	Q'ty	Remarks
1	031110142	Side Panel L	1	
2	031110132	Side Panel R	1	
3	031010293	Holder, Cushion	2	
4	031010351	Holder, Stock Bobbin	2	
5	037011460	Rear Stay, 12-ch	1	
6	514400004	Terminal, SQ0204-02	1	
7	518110004	Line Filter, FN323-6101	1	
8	731011771	Main, Stay 1, 12-ch	1	
9	031011762	Partition Panel, 12-ch	1	
10	033000510	Main Stay 2, 12-ch	1	
11	031016320	Spacer, Side Panel B	2	
12	031016300	Side Panel B, L	1	
13	031016901	Writing Panel, 12-ch	1	
14	031016310	Side Panel B, R	1	
15	031016922	Tension Shaft, 12-ch	1	
16	731017794	Tension Drum, 12-ch	1	
17	031017741	Collar, Tension Drum	1	
18	031000590	Spacer, Tension Drum	1	
19	031016294	Cutter Arm Spring	2	
20	731011963	Cushion L	1	
21	031013871	Shaft, Cutter Arm	2	
22	031016431	Cutter Arm L	1	
23	341712010	O-Ring, P-12	4	
24	031016492	Pinch Roller	2	
25	031016984	Pinch Roller Shaft, 12-ch	1	
26	731016001	Cutter Arm R	1	
27	731010333	Cushion, R	1	
28	031016940	Cutter, 12-ch	1	
29	731011933	Guide C, 12-ch		
30	303101010	Catch, TL-60-Z-CR	2	
31	031010371	Hinge	2	
32	031010380	Hinge Spacer	4	
33	033000250	Front Panel, 12-ch	1	
34	031011745	Front Stay B, 12-ch	1	
35	031011734	Front Stay A, 12-ch	1	
36	031010211	Front Stay Holder	2	
37	731010310	Cushion	2	
38	509200022	Motor, PH-268-21-A8	1	
39	037010051	Power Switch Holder	1	
40	508101010	Power Switch	1	
41	031011995	Support B, Side Cover	1	
42	037010032	Support A, Side Cover	1	
43	067116350	Gear	1	
44	031016082	Drive Shaft A	1	
45	031019930	Spacer	1	

Mainframe 3, 12 Channels

Item	Part No.	Description	Q'ty	Remarks
46	310905050	Ball Bearing, MF95ZZS	6	
47	031014150	Ring	2	
48	731016052	Pulley B	1	
49	031016142	Tension Gear B	1	
50	031016124	Drive Shaft B	1	
51	031114370	Slip Pulley Assembly	1	
52	031016272	Cutter Spacer	2	
53	031011980	Spacer, P.C.B.	1	
54	731010071	Bearing Holder, T	1	
55	031017600	Magnet Rubber, 12-ch	1	
56	731010041	Bearing Holder, S	1	
57	373201003	Clutch, NHF-04	1	
58	303500025	Spacer, SQ-7.5	2	
59	773500116	Printer Control Backup P.C.B.	1	
60	031017700	Holder, Print P.C.B. Guide	1	
61	513400011	P.C.B. Guide, KEL50-6010	1	
62	031017710	Support, Printer P.C.B.	2	
63	773300017	Printer Board, WR3300	1	
64	031018440	Roller	4	

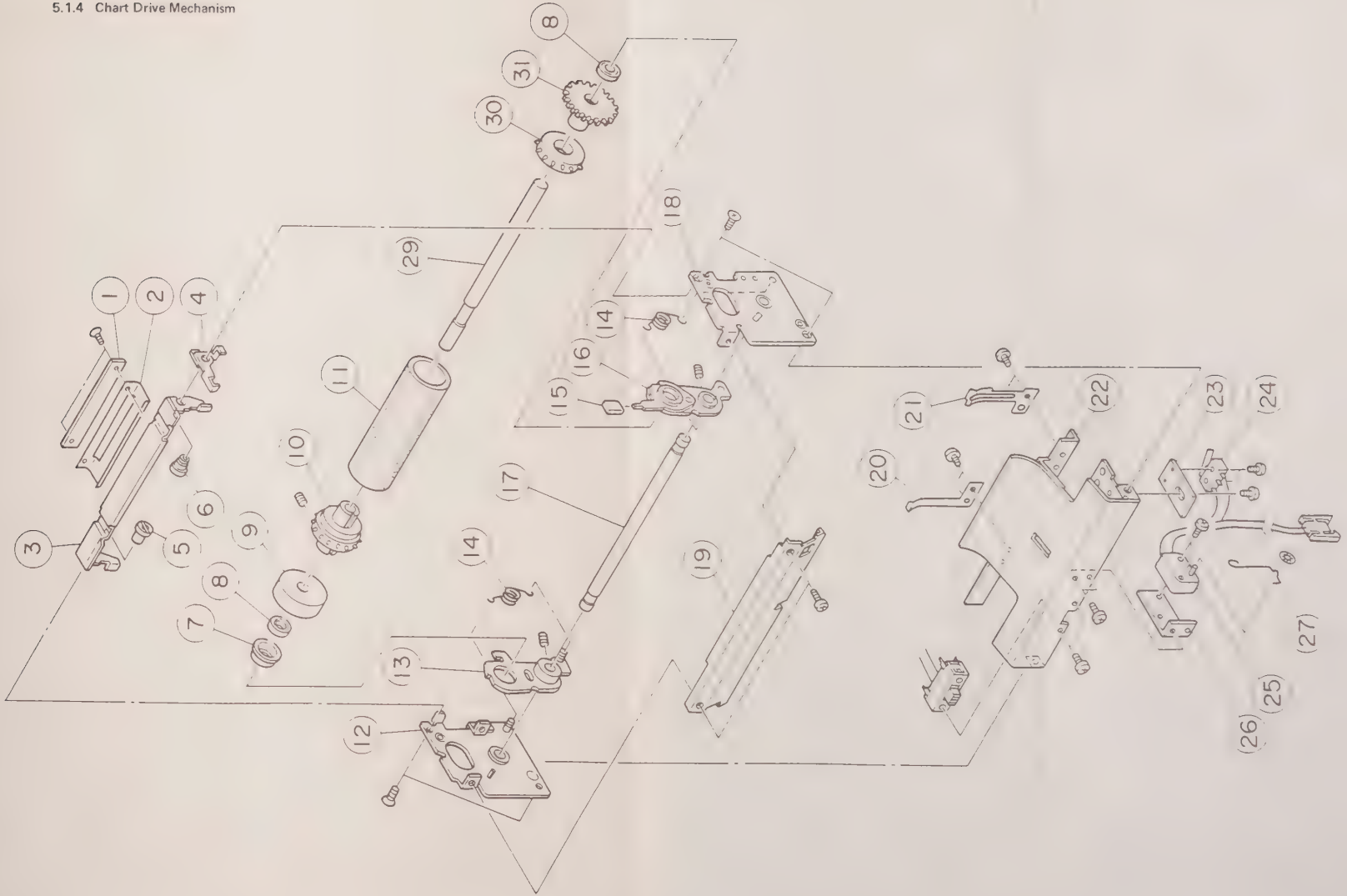

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Chart Drive Mechanism, 2 Channels

Item	Part No.	Description	Q'ty	Remarks
1	031012400	Metal, Paper Retainer	1	
2	031002393	Paper Retainer	1	
3	731012911	Pen Lift Unit, 2-ch	1	
4	731012211	Hook Assembly	1	
5	031012032	Pen Lift Shaft, L	1	
6	031012302	Pen List Shaft, R	1	
7	031012241	Bearing Holder, L	1	
8	311408030	Ball Bearing	2	
9	031018942	Drum Spacer	1	
10	310000080	Sprocket Assembly	1	SBS6B12V001
11	731012973	Writing Drum, 2-ch	1	
12	731012011	Side Panel, L	1	
13	731012114	Drum Arm Assembly, L	1	
14	031012201	Drum Arm Spring	2	
15	031012190	Cap	1	
16	731012155	Drum Arm Assembly, R	1	
17	031012921	Arm Shaft, 2-ch	1	
18	731012071	Side Plate, R	1	
19	031012964	Guide, B, 2-ch	1	
20	031012330	Paper Retainer, L	1	
21	031012341	Paper Retainer, R	1	
22	731012933	Paper Guide Assembly, A, 2-ch	1	
23	031019941	Micro Switch Holder, C	1	
24	508401010	Micro Switch	1	
25	508401004	Micro Switch	1	
26	031012353	Micro Switch Holder, A	1	
27	031012361	Actuator	1	
29	031012991	Drum Shaft, 2-ch	1	
30	031012262	Sprocket	1	
31	031014710	Drive Gear	1	

Chart Drive Mechanism, 4 Channels

Item	Part No.	Description	Q'ty	Remarks
1	031012400	Metal, Paper Retainer	2	
2	031002393	Paper Retainer	2	
3	731012711	Pen Lift Unit, 4-ch	1	
4	731012211	Hook Assembly	1	
5	031012032	Pen Lift Shaft, L	1	
6	031012302	Pen Lift Shaft, R	1	
7	031012241	Bearing Holder, L	1	
8	311408030	Ball Bearing	2	
9	031018942	Drum Spacer	1	
10	310000080	Sprocket Assembly	1	SBS6B12V001
11	731012773	Writing Drum, 4-ch	1	
12	731012011	Side Plate, L	1	
13	731012114	Drum Arm Assembly, L	1	
14	031012201	Drum Arm Spring	2	
15	031012190	Cap	1	
16	731012155	Drum Arm Assembly, R	1	
17	031012801	Arm Shaft, 4-ch	1	
18	731012071	Side Plate, R	1	
19	031012764	Guide, B, 4-ch	1	
20	031012330	Paper Retainer, L	1	
21	031012341	Paper Retainer, R	1	
22	731012733	Paper Guide Assembly, A, 4-ch	1	
23	031019941	Micro Switch Holder, C	1	
24	508401010	Micro Switch	1	
25	508401004	Micro Switch	1	
26	031012353	Micro Switch Holder, A	1	
27	031012361	Actuator	1	
29	031012791	Drum Shaft, 4-ch	1	
30	031012262	Sprocket	1	
31	031014710	Drive Gear	1	

Chart Drive Mechanism, 6 Channels

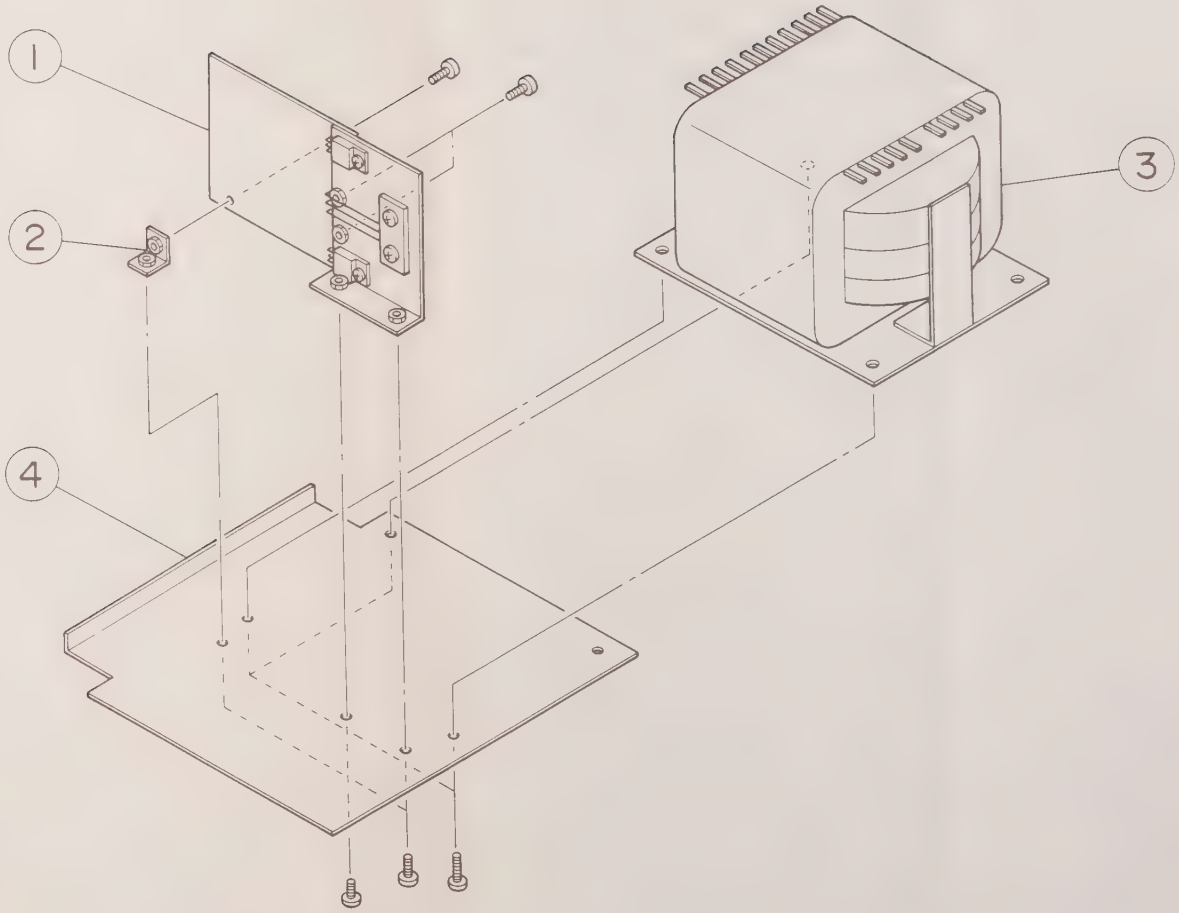
Item	Part No.	Description	Q'ty	Remarks
1	031012400	Metal, Paper Retainer	3	
2	031002393	Paper Retainer	3	
3	731012611	Pen Lift Unit, 6-ch	1	
4	731012211	Hook Assembly	1	
5	031012032	Pen Lift Shaft, L	1	
6	031012302	Pen Lift Shaft, R	1	
7	031012241	Bearing Holder, L	1	
8	311408030	Ball Bearing	2	
9	031018942	Drum Spacer	1	
10	310000080	Sprocket Assembly	1	SBS6B12V001
11	731012673	Writing Drum, 6-ch	1	
12	731012011	Side Plate, L	1	
13	731012114	Drum Arm Assembly, L	1	
14	031012201	Drum Arm Spring	2	
15	031012190	Cap	1	
16	731012155	Drum Arm Assembly, R	1	
17	031012701	Arm Shaft, 6-ch	1	
18	731012071	Side Plate, R	1	
19	031012664	Guide B, 6-ch	1	
20	031012330	Paper Retainer, L	1	
21	031012341	Paper Retainer, R	1	
22	731012631	Paper Guide Assembly A, 6-ch	1	
23	031019941	Micro Switch Holder, C	1	
24	508401010	Micro Switch	1	
25	508401004	Micro Switch	1	
26	031012353	Micro Switch Holder, A	1	
27	031012361	Actuator	1	
29	031012691	Drum Shaft, 6-ch	1	
30	031012262	Sprocket	1	
31	031014710	Drive Gear	1	

Chart Drive Mechanism, 8 Channels

Item	Part No.	Description	Q'ty	Remarks
1	031012400	Metal, Paper Retainer	4	
2	031002393	Paper Retainer	4	
3	731012411	Pen Lift Unit, 8-ch	1	
4	731012211	Hook Assembly	1	
5	031012032	Pen Lift Shaft, L	1	
6	031012302	Pen Lift Shaft, R	1	
7	031012241	Bearing Holder, L	1	
8	311408030	Ball Bearing	2	
10	310000080	Sprocket Assembly	1	SBS6B12V001
11	731012473	Writing Drum Assembly, 8-ch	1	
12	731012011	Side Plate, L	1	
13	731012114	Drum Arm Assembly, L	1	
14	031012201	Drum Arm Spring	2	
15	031012190	Cap	1	
16	731012155	Drum Arm Assembly, R	1	
17	031012501	Arm Shaft, 8-ch	1	
18	731012071	Side Plate, R	1	
19	031012464	Guide B, 8-ch	1	
20	031012330	Paper Retainer, L	1	
21	031012341	Paper Retainer, R	1	
22	731012431	Paper Guide Assembly A, 8-ch	1	
23	031019941	Micro Switch Holder, C	1	
24	508401010	Micro Switch	1	
25	508401004	Micro Switch	1	
26	031012353	Micro Switch Holder, A	1	
27	031012361	Actuator	1	
29	031012491	Drum Shaft, 8-ch	1	
30	031012262	Sprocket	1	
31	031014710	Drive Gear	1	

Chart Drive Mechanism, 12 Channels

Item	Part No.	Description	Q'ty	Remarks
1	031012400	Metal, Paper Retainer	6	
2	031002393	Paper Retainer	6	
3	731012511	Pen Lift Unit, 12-ch	1	
4	731012211	Hook Assembly	1	
5	031012032	Pen Lift Shaft, L	1	
6	031012302	Pen Lift Shaft, R	1	
7	031012241	Bearing Holder, L	1	
8	311408030	Ball Bearing	2	
9	031018942	Drum Spacer	1	
10	310000080	Sprocket Assembly	1	SBS6B12V001
11	731012573	Writing Drum, 12-ch	1	
12	731012011	Side Plate, L	1	
13	731012114	Drum Arm Assembly, L	1	
14	031012201	Drum Arm Spring	2	
15	031012190	Cap	1	
16	731012155	Drum Arm Assembly, R	1	
17	031012601	Arm Shaft, 12-ch	1	
18	731012071	Side Plate, R	1	
19	031012564	Guide B, 12-ch	1	
20	031012330	Paper Retainer, L	1	
21	031012341	Paper Retainer, R	1	
22	731012531	Paper Guide Assembly A, 12-ch	1	
23	031019941	Micro Switch Holder, C	1	
24	508401010	Micro Switch	1	
25	508401004	Micro Switch	1	
26	031012353	Micro Switch Holder, A	1	
27	031012361	Actuator	1	
29	031012593	Drum Shaft, 12-ch	1	
30	031012262	Sprocket	1	
31	031014710	Drive Gear	1	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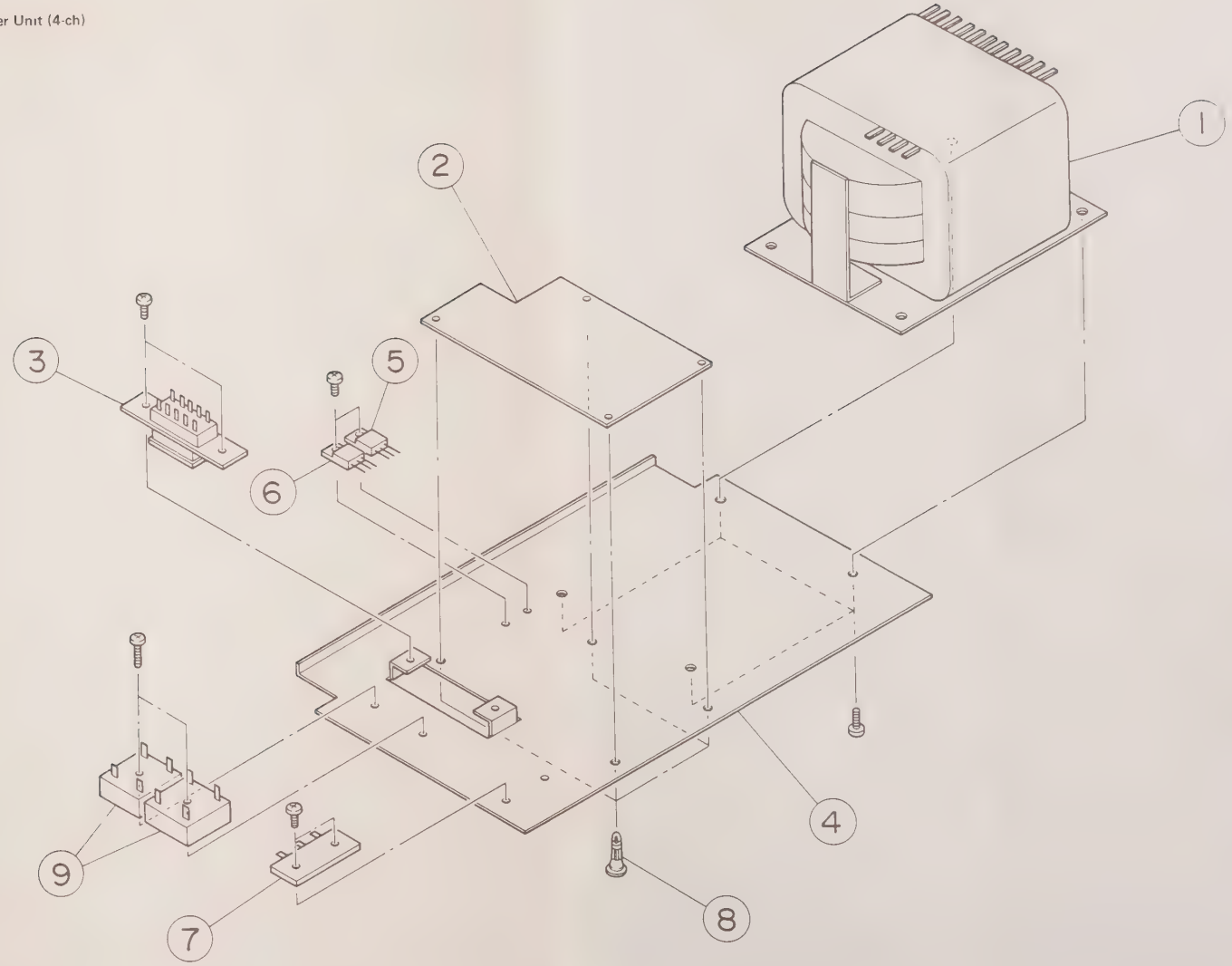
Power Unit, 2 Channels

Item	Part No.	Description	Q'ty	Remarks
1	773300026	Power Board, 3300-2	1	
2	037011530	Power Board Support	1	
3	510310011	Power Transformer,3101-2CH-1	1	
4	033000310	Bottom Plate, 2-ch	1	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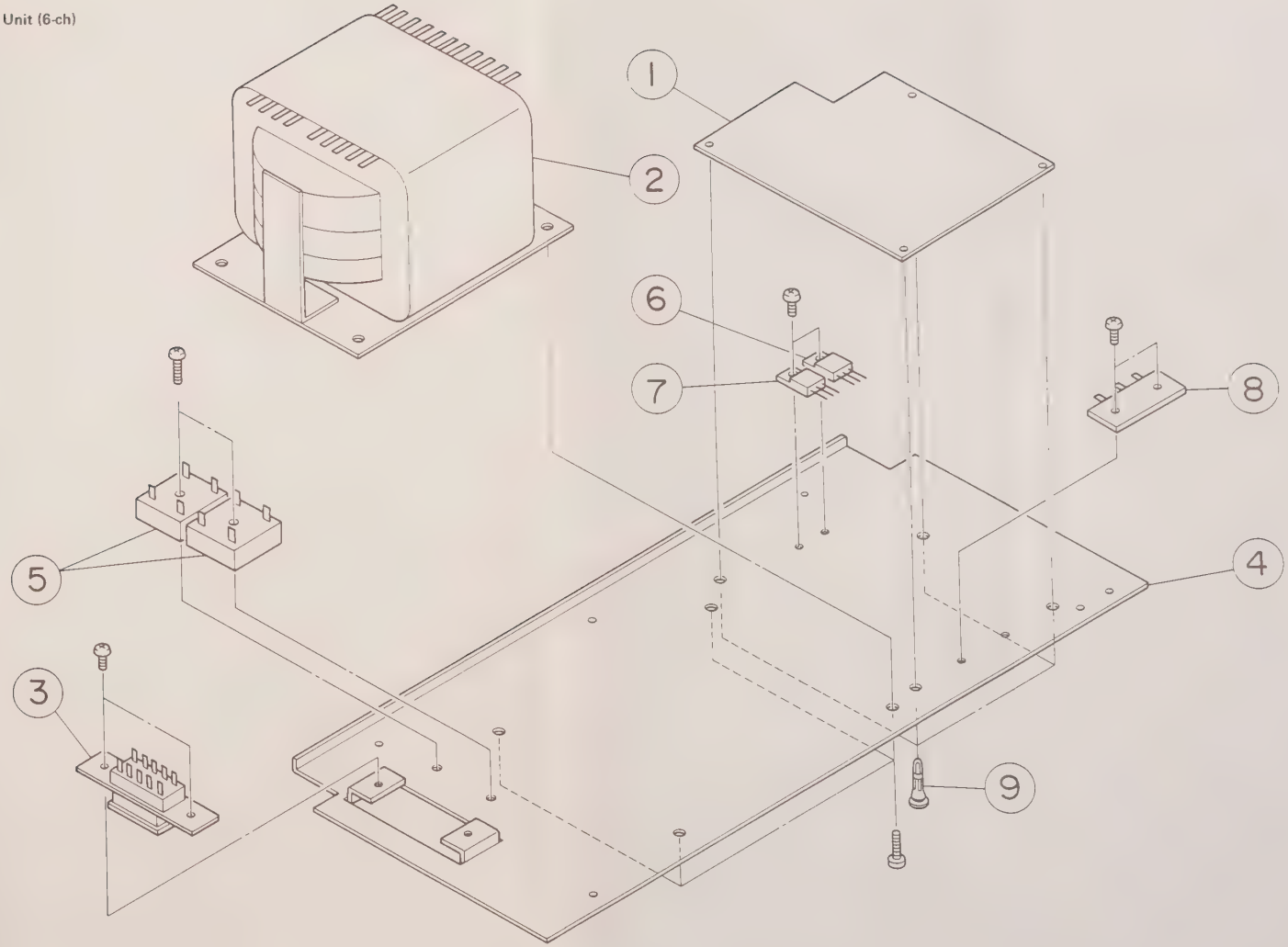
Power Unit, 4 Channels

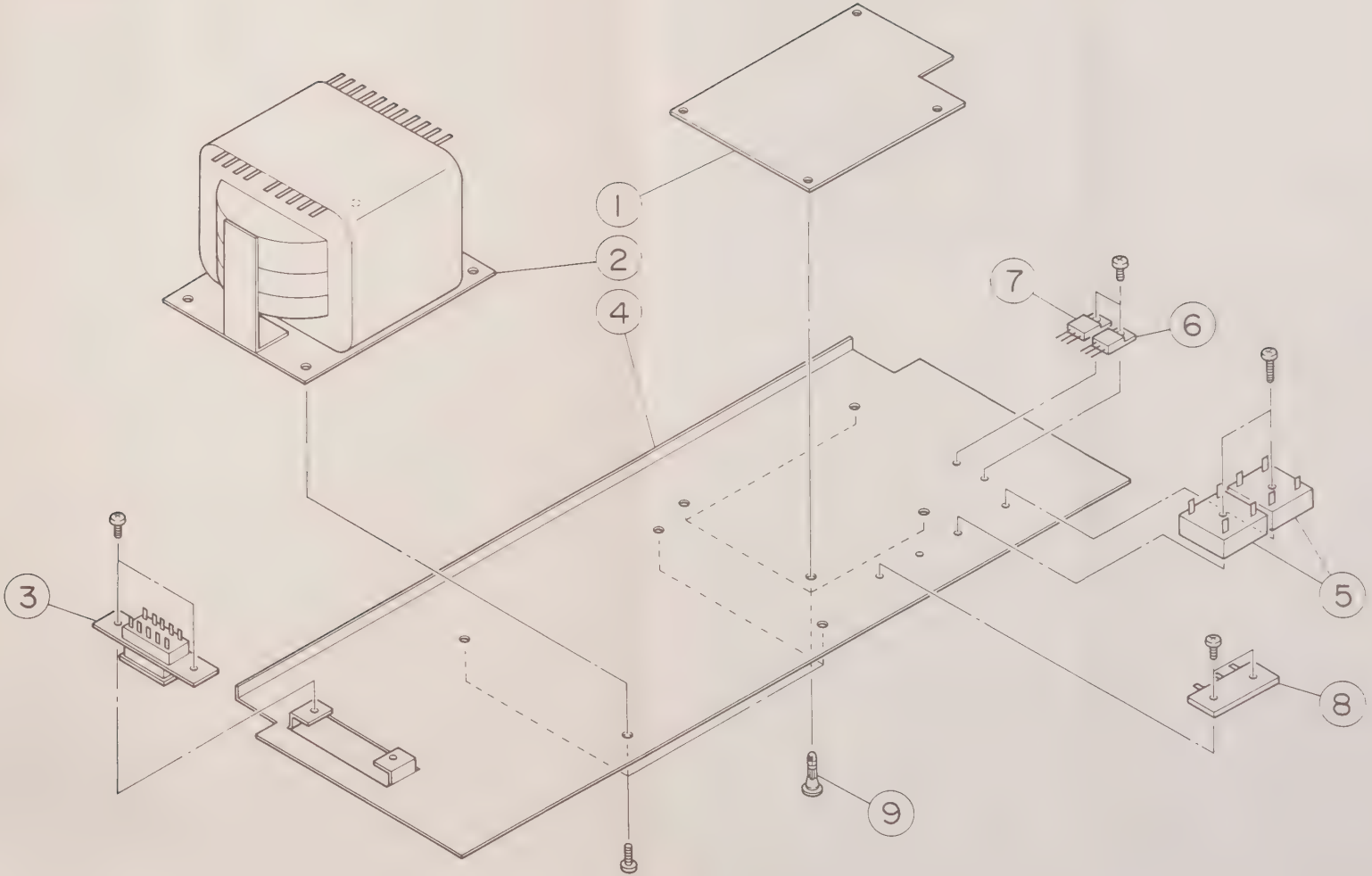
Item	Part No.	Description	Q'ty	Remarks
1	510310021	Power Transformer,3101-4CH-B	1	
2	771370146	Power Board, 4-ch	1	
3	513501001	AC Selector, 9208	1	
	513501002	AC Selector, 9209	1	
4	033000320	Bottom Plate, 4-ch	1	
5	503300128	μPC7805H	1	
6	503200028	T, 2SD560	1	
7	503203050	T, 2SD845, O	1	
8	303500030	Spacer, KGLS-10R	4	
9	503103013	SD, KBPC25-02	1	

5.1.7 Power Unit (6-ch)



Power Unit, 6 Channels

Item	Part No.	Description	Q'ty	Remarks
1	771370156	Power Board, 8-ch	1	
2	510310031	Power Transformer,3101-8CH-A	1	
3	513501001	AC Selector, 9208	1	
	513501002	AC Selector, 9209	1	
4	033000331	Bottom Plate, 6-ch	1	
5	503103013	KBPC25-02	2	
6	503300128	μPC7805H	1	
7	503200028	2SD560	1	
8	503203050	2SD845, O	1	
9	303500030	Spacer, KGLS-10R	4	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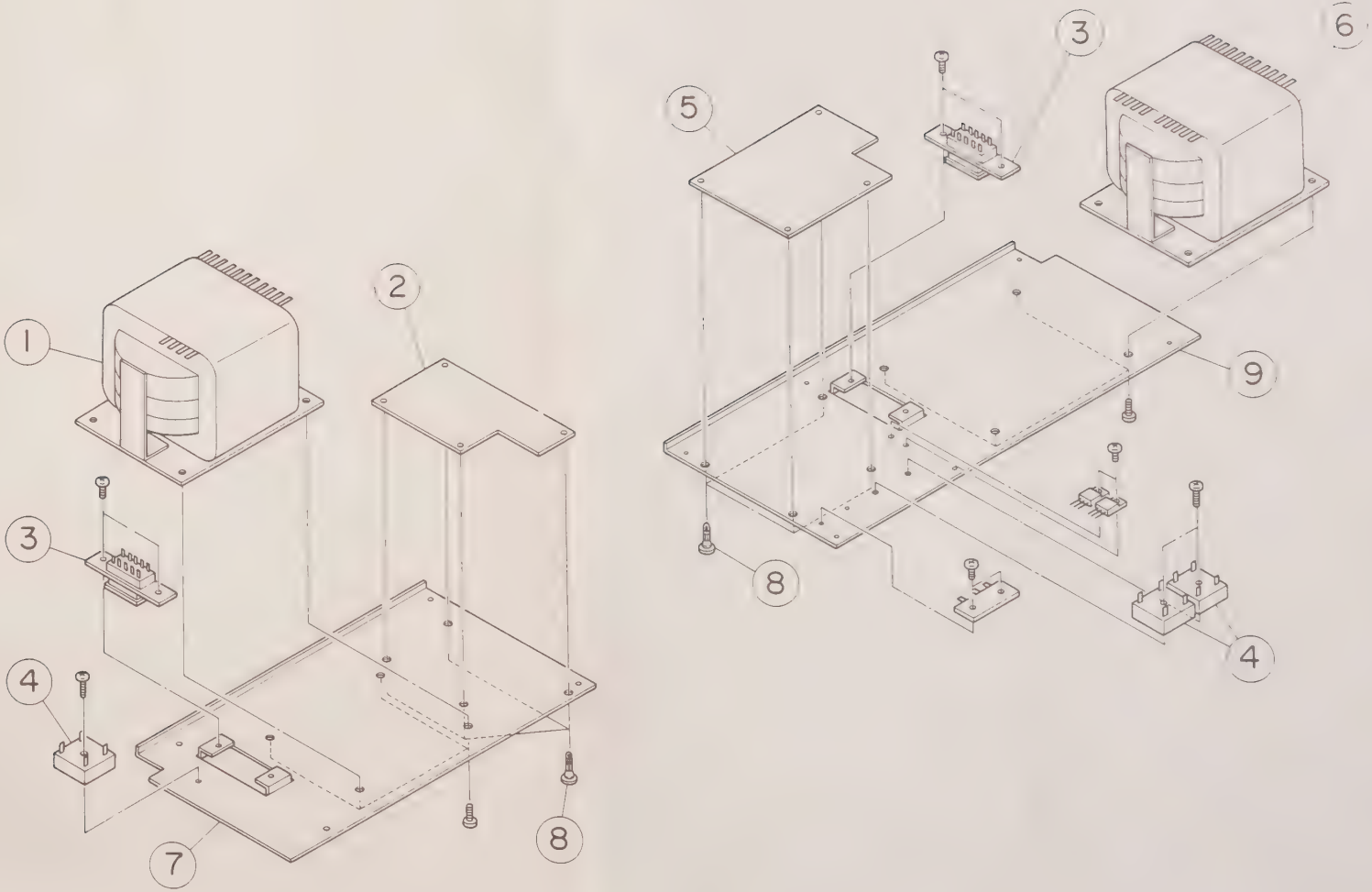
Power Unit, 8 Channels

Item	Part No.	Description	Q'ty	Remarks
1	771370156	Power Board, 8-ch	1	
2	510310031	Power Transformer,3101-8CH-A	1	
3	513501001	AC Selector, 9208	1	
	513501002	AC Selector, 9209	1	
4	033000340	Bottom Plate, 8-ch	1	
5	503103013	SD, KBPC25-02	2	
6	503300128	μPC7805H	1	
7	503200028	2SD560	1	
8	503203050	2SD845, O	1	
9	303500030	Spacer, KGLS-10R	4	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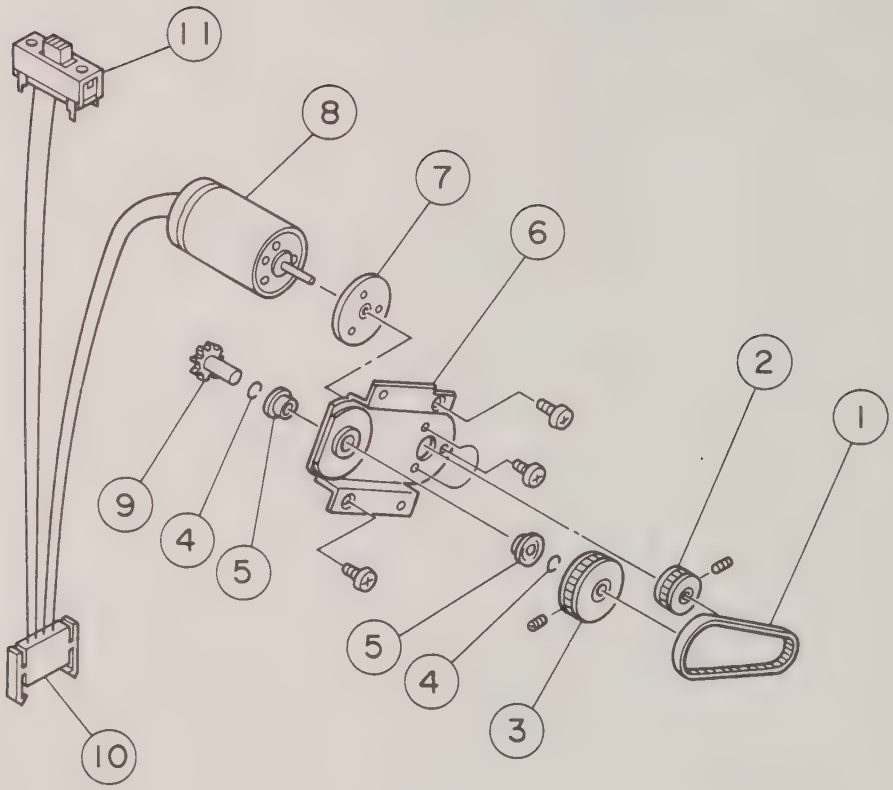
Power Unit, 12 Channels

Item	Part No.	Description	Q'ty	Remarks
1	510310021	Power Transformer,3101-4CH-B	1	
2	773300067	Power Board, 12-ch B	1	
3	513501001	AC Selector, 9208	2	
	513501002	AC Selector, 9209	2	
4	503103013	KBPC25-02	3	
5	773300066	Power Board, 12-ch A	1	
6	510310031	Power Transformer,3101-8CH-A	1	
7	033000370	Bottom Plate, 12-4	1	
8	303500030	Spacer, KGLS-10R	8	
9	033000381	Bottom Plate, 12-8	1	

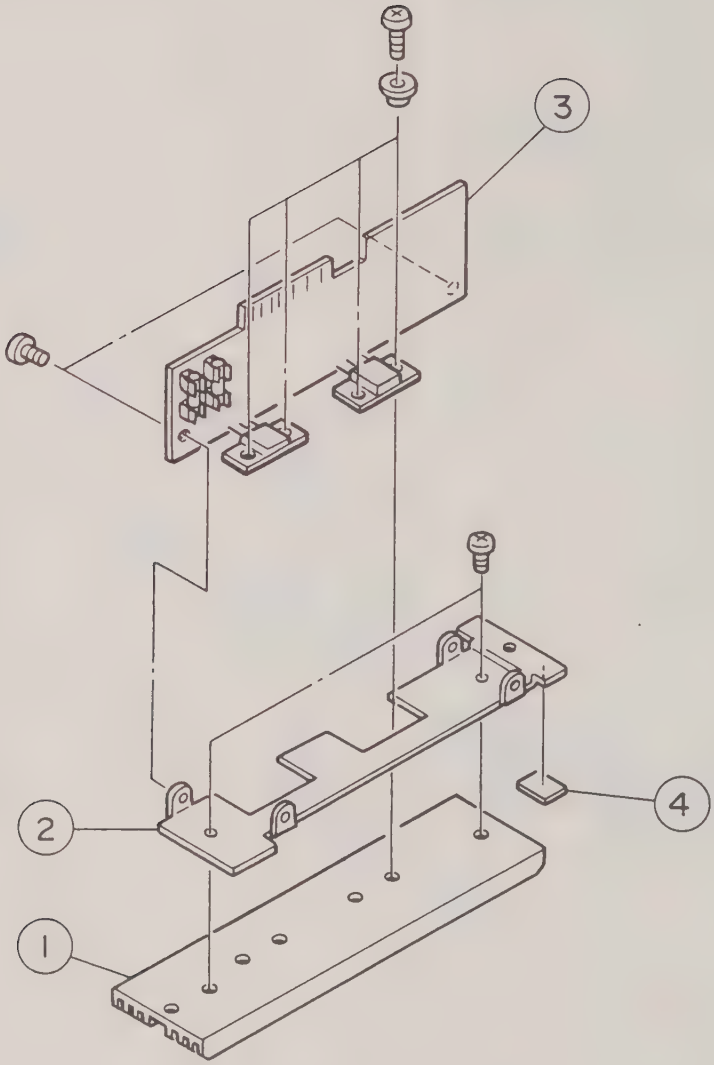
5.1.10 Rewind Unit Assembly



Rewind Unit Assembly

Item	Part No.	Description	Q'ty	Remarks
1	373201002	Synchro Belt 71MXL3.2	1	
2	731016210	Pulley E	1	
3	731016092	Pulley C	1	
4	031014150	Spacer	2	
5	310905050	Ball Bearing (MF95ZZS)	2	
6	731016150	Metal Assembly, Paper Tension Roller	1	
7	031018950	Motor Spacer	1	
8	509100017	DC Motor	1	
9	731016181	Gear Assembly, Paper Tension	1	
10	513500433	Wire Assembly	1	
11	508302005	Switch	1	

5.1.11 Servo Amplifier Unit



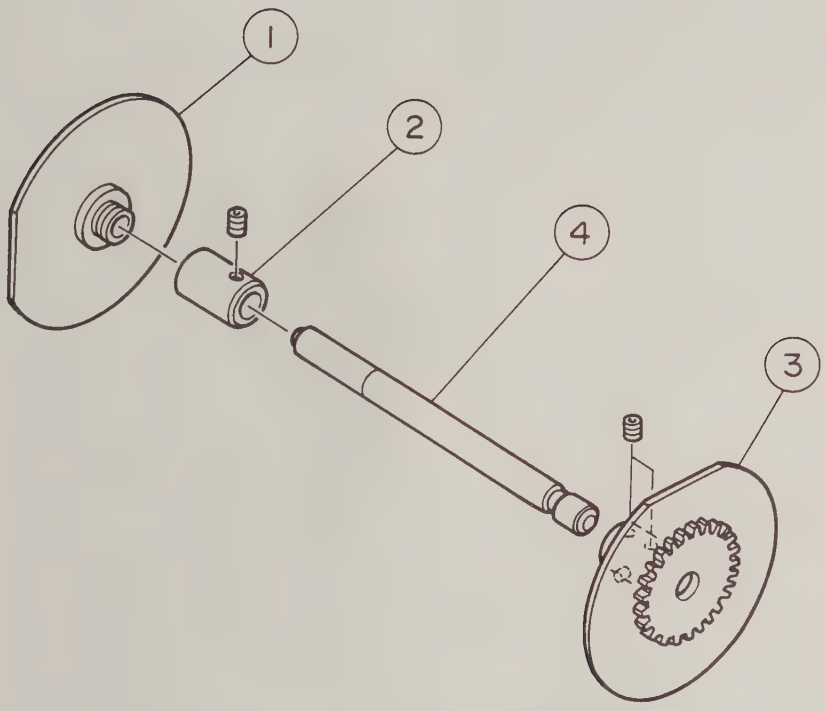
SSA3310
Servo Amplifier Unit, Single

Item	Part No.	Description	Q'ty	Remarks
1	031117240	Heat Sink 3101	1	
2	031117210	Stay, Servo Amp. PCB	1	
3	773500691	Servo Amp. B, WR3500S	1	
4	033007410	Name Plate, SSA3310	1	

WSA3310
Servo Amplifier Unit, Wide

Item	Part No.	Description	Q'ty	Remarks
1	031117240	Heat Sink 3101	1	
2	031117210	Stay, Servo Amp. PCB	1	
3	773500692	Servo Amp. B. WR3500W	1	
4	033007420	Name Plate, WSA3310	1	

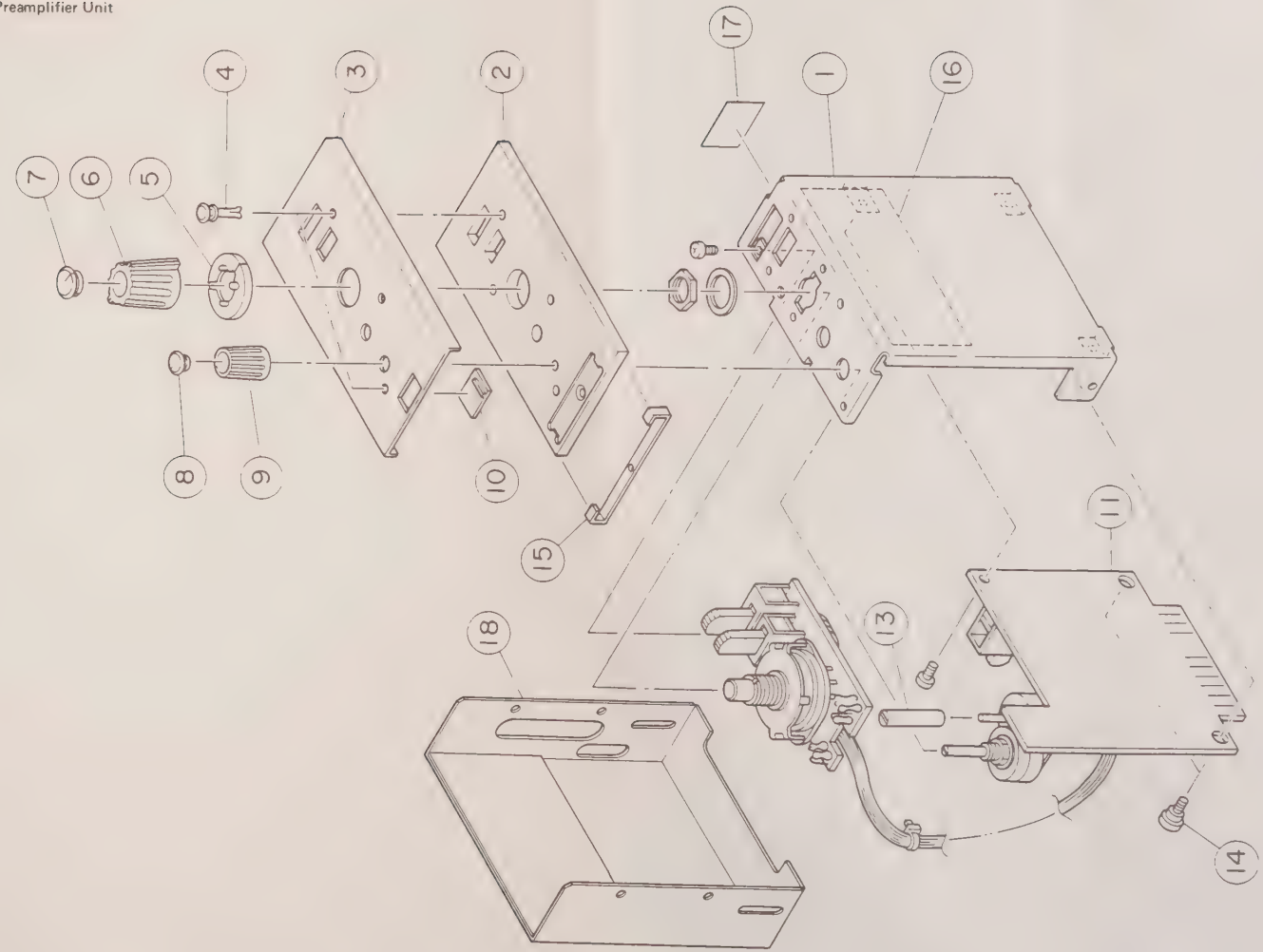
5.1.12 Stock Bobbin



Stock Bobbin

Item	Part No	Description	Q'ty	Remarks
1	731014661	Bobbin Flange L	1	
2	031014641	Bobbin L	1	
3	731014604	Bobbin Flange R	1	
4	731014752	Bobbin Shaft Assembly, 2-ch	1	for 2-ch Type
	731014762	" , 4-ch	1	for 4-ch Type
	731014771	" , 6-ch	1	for 6-ch Type
	731014781	" , 8-ch	1	for 8-ch Type
	731014791	" , 12-ch	1	for 12-ch Type

5.1.13 Preamplifier Unit



Item	Part No.	Description	Q'ty	Remarks
1	731017035	Amp. Chassis	1	
2	031017062	Insulator, Chassis	1	
3	033007040	L, Amp. Panel, S	1	
4	304401027	Plastic Rivet	2	
5	516100030	Nut Cover	1	
6	516100028	Range Knob	1	
7	516100029	Knob Cap, Range	1	
8	516100018	Knob Cap, Position	1	
9	516100016	Position Knob	1	
10	067117030	Slide Panel	1	
11	774310131	Preamplifier P.C.B., L	1	
13	031017081	Plastic Shaft	1	
14	068017920	Preamp. Screw Bolt	2	
16	037017150	Insulation Film, Chassis	1	
17	035007230	Insulation Film	1	

Item	Part No.	Description	Q'ty	Remarks
1	731017035	Amp. Chassis	1	
2	031017132	Insulator, Chassis	1	
3	033007050	L. Amp. Panel, W	1	
4	304401027	Plastic Rivet	2	
5	516100030	Nut Cover	1	
6	516100028	Range Knob	1	
7	516100029	Knob Cap, Range	1	
8	516100018	Knob Cap, Position	1	
9	516100016	Position Knob	1	
10	067117030	Slide Panel	1	
11	774310131	Preamplifier P.C.B., L	1	
13	031017081	Plastic Shaft	1	
14	068017920	Preamp. Screw Bolt	2	
16	037017150	Insulation Film, Chassis	1	
17	035007230	Insulation Film	1	

Item	Part No.	Description	Q'ty	Remarks
1	731017035	Amp. Chassis	1	
2	031017062	Insulator, Chassis	1	
3	033007070	H. Amp. Panel, S	1	
4	304401027	Plastic Rivet	2	
5	516100030	Nut Cover	1	
6	516100028	Range Knob	1	
7	516100029	Knob Cap, Range	1	
8	516100018	Knob Cap, Position	1	
9	516100016	Position Knob	1	
10	067117030	Slide Panel	1	
11	774310141	Preamplifier P.C.B., H	1	
13	031017081	Plastic Shaft	1	
14	068017920	Preamp. Screw Bolt	2	
16	037017150	Insulation Film, Chassis	1	
17	035007230	Insulation Film	1	

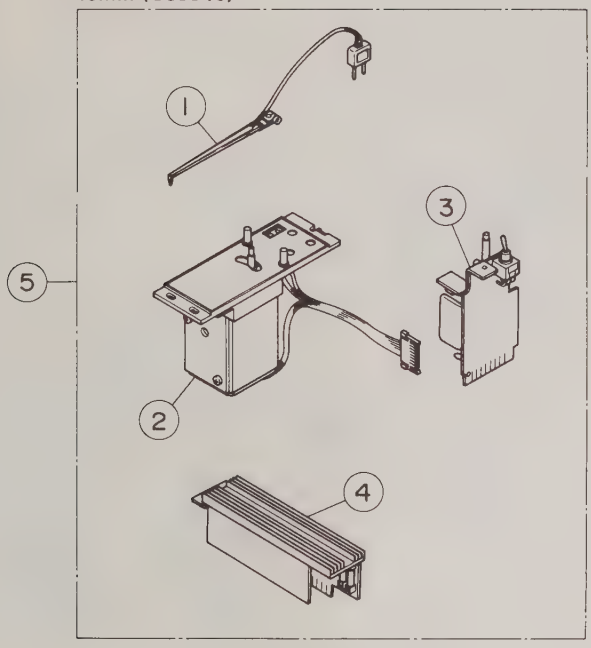
Item	Part No.	Description	Q'ty	Remarks
1	731017035	Amp. Chassis	1	
2	031017132	Insulator, Chassis	1	
3	033007080	H. Amp. Panel, W	1	
4	304401027	Plastic Rivet	2	
5	516100030	Nut Cover	1	
6	516100028	Range Knob	1	
7	516100029	Knob Cap, Range	1	
8	516100018	Knob Cap, Position	1	
9	516100016	Position Knob	1	
10	067117030	Slide Panel	1	
11	774310141	Preamplifier P.C.B.1	1	
13	031017081	Plastic Shaft	1	
14	068017920	Preamp. Screw Bolt	2	
16	037017150	Insulation Film, Chassis	1	
17	035007230	Insulation Film	1	

Item	Part No.	Description	Q'ty	Remarks
1	067117013	Amp. Chassis	1	
2	035007920	Insulator, Chassis	1	
3	033007140	Z. Amp. Panel, S	1	
4	304401033	Plastic Rivet	2	
6	516100016	Range Knob	1	
7	516100018	Knob Cap, Range	1	
8	516100017	Knob Cap, Position	1	
9	516100019	Position Knob	1	
10	067117030	Slide Panel	1	
11		Preamplifier P.C.B.	1	
13	031017081	Plastic Shaft	1	
14	068017920	Preamp. Screw Bolt	2	
15	035007940	Contact Strip, S	1	
16	067117060	Insulation Film, Chassis	1	
18	043007203	Cover	1	

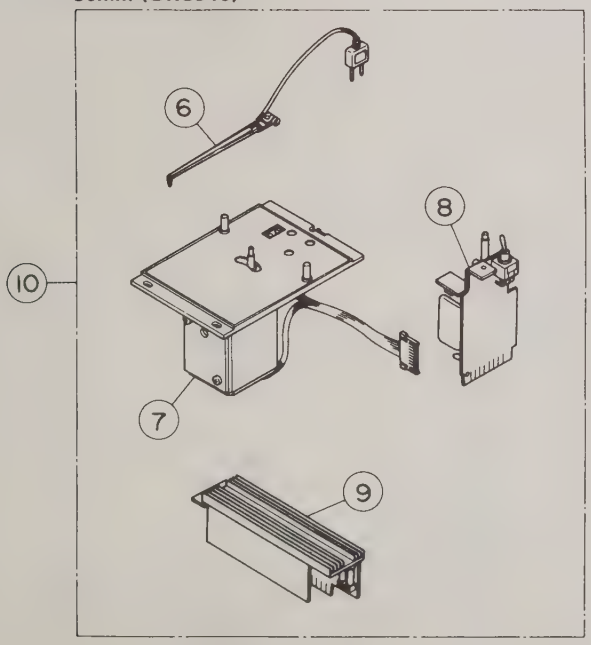
Item	Part No.	Description	Q'ty	Remarks
1	067117013	Amp. Chassis	1	
2	035007930	Insulator, Chassis, W	1	
3	033007150	Z. Amp. Panel, W	1	
4	304401033	Plastic Rivet	2	
6	516100016	Range Knob	1	
7	516100018	Knob Cap, Range	1	
8	516100017	Knob Cap, Position	1	
9	516100019	Position Knob	1	
10	067117030	Slide Panel	1	
11		Preamplifier P.C.B.	1	
13	031017081	Plastic Shaft	1	
14	068017920	Preamp. Screw Bolt	2	
15	035007950	Contact Strip, W	1	
16	067117060	Insulation Film, Chassis	1	
18	043007203	Cover	1	

5.1.14 Pen Motor Unit

40mm (GS3310)

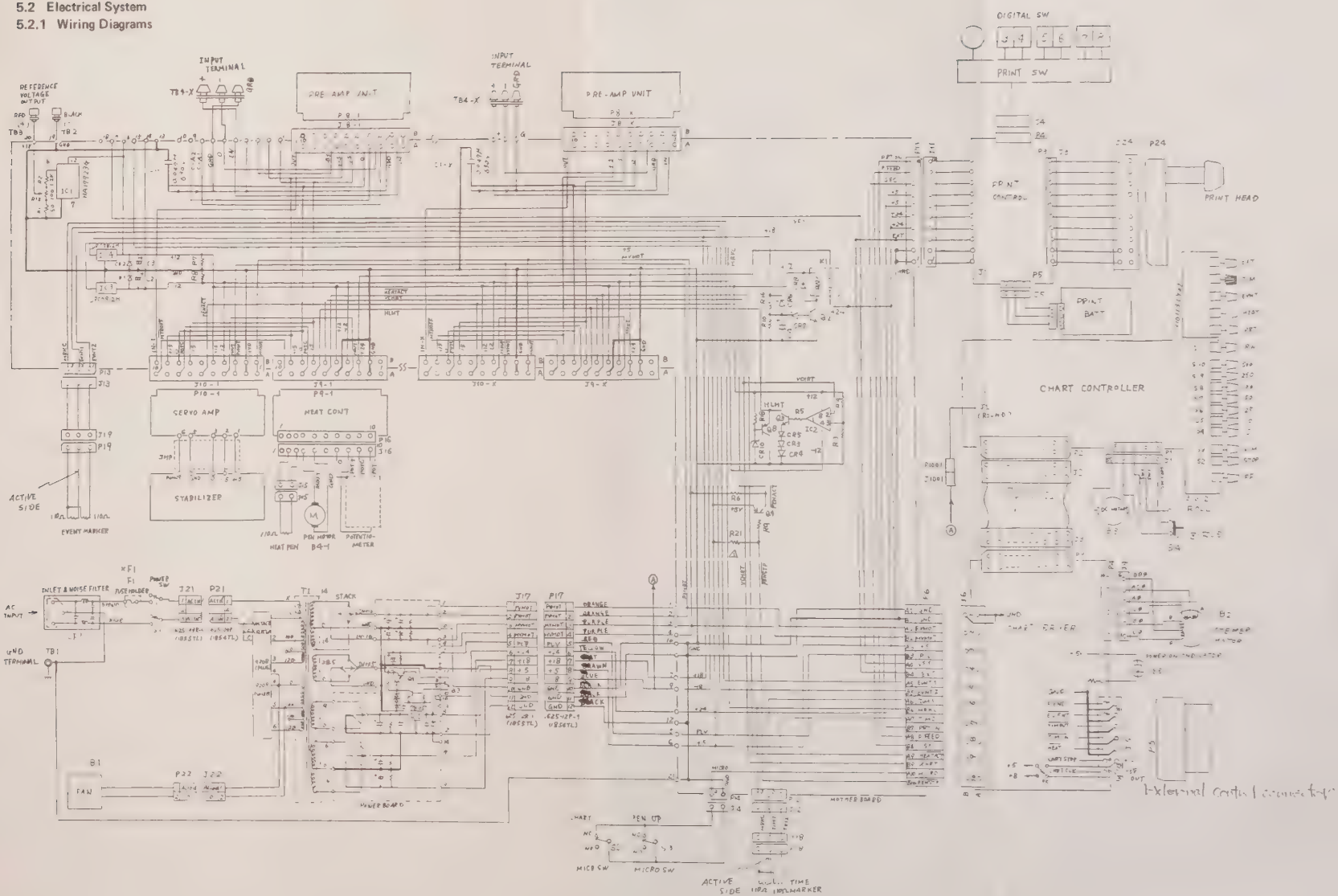


80mm (GW3310)



Pen Motor Unit

Item	Block No.	Description		Remarks
1	933500251	Pen KT201A (40mm p-p)		
2	793310012	Pen Motor SPM33310 (40mm p-p)		
3	793101032	Heat Control Unit SHC3101N (40mm p-p)		
4	793310011	Servo Amp. SSA3310 (40mm p-p)		
5	803310001	Pen Motor Set GS3310 (40mm p-p)		
6	933500252	Pen KT202A (80mm p-p)		
7	793310014	Pen Motor WPM3310 (80mm p-p)		
8	793101033	Heat Control Unit WHC3101N (80mm p-p)		
9	793310013	Servo Amp. WSA3310 (80mm p-p)		
10	803310002	Pen Motor Set GW3310 (80mm p-p)		


DIGITAL SW
PRINT SW
INPUT TERMINAL
PRE-AMP UNIT
PRINT HEAD
PRINT CONTROL
PRINT BATT
CHART CONTROLLER
SERVO AMP
HEAT CONT
STABILIZER
ACTIVE SIDE
EVENT MARKER
HEAT PEN
PEN MOTOR B4-1
POTENTIO-METER
INLET & NOISE FILTER
FUSEHOLDER
POWER SW
AC INPUT
GND TERMINAL
STACK
FAN
MOTHER BOARD
CHART
PEN UP
MICRO SW
TIME MARKER
External control connector

Wiring Diagram

(1/2)

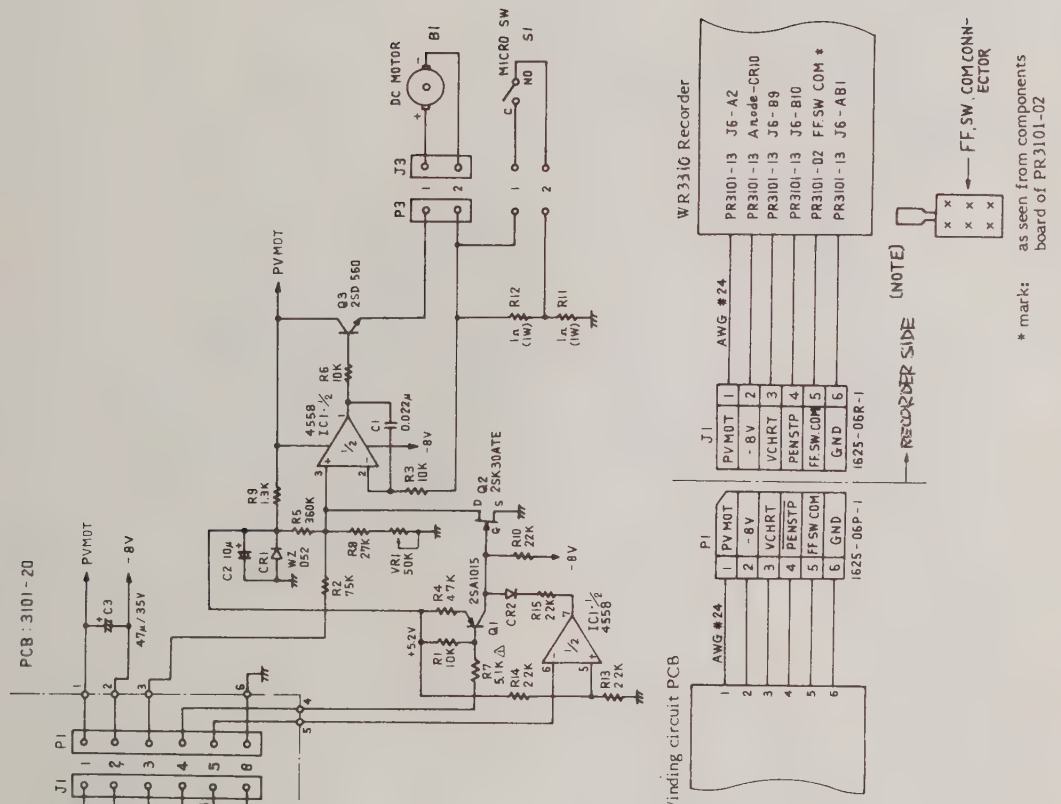
Figure	Part No.	Description			Type	Remarks
W1	520100017	AC Cord			DC011-001	
LF1	518110004	Line Filter	6A		FN323-6101	
XF1	512400002	Fuse Holder			SN-2056	
S1	508101010	Switch, Push	250VAC, 4A		1P-0008AC1920	
S2	508401004	" , Micro			CC-5-R	
S3	508401010	" , Micro			SS-5GL	
S4	508302005	" , Slide			SSB022L6, R, NS	
TB1	514400004	Terminal			SQ0204-02	
TB2	514400005	"	Red		PTJ470A2	
TB3	514400006	"	Black		PTJ470A0	
TB4-X	514400010	Input Terminal	3P	Red	W-R	x2 xCH
	514400011	Input Terminal	3P	Black	W-B	xCH
J1	513400044	Connector, Receptacle	5P		HNC2-2.5S-5	
CNP	513400037	Contact Pin			HNC-2.5S-A	x5, For J1
J4	513400036	Connector, Receptacle	4P		HNC2-2.5S-6	
CNP	513400037	Contact Pin			HNC-2.5S-A	x6, For J4 for EXTP
P5	513100321	Connector, Plug	14P		57-30140	Cont.
J7	513300609	Connector	6Px2		225J20621-488	
J12	513400041	Connector, Receptacle	3P		HNC2-2.5S-3	
CNP	513400042	Contact Pin			HNC-2.5S-B	x3, For J12
J13	513400041	Connector, Receptacle	3P		HNC2-2.5S-3	
CNP	513400042	Contact Pin			HNC-2.5S-B	x3, For J13
J14	513400043	Connector, Receptacle	2P		HNC2-2.5S-2	
CNP	513400042	Contact Pin			HNC-2.5SOB	x2, For J14
J18	513200311	Connector, Receptacle	3P		3965-SC	Pair
P18		" , Plug	3P			
J19	513200311	Connector, Receptacle	3P		3965-SC	Pair
P19		" , Plug	3P			
J21	513200302	Connector, Receptacle	3P		1625-3R	
CNP	513400022	Contact Pin			1561TL	x2, For J21
J22	513200202	Connector, Plug	2P		1625-2P-1	
CNP	513400001	Contact Pin			1854TL	x2, For J22 For 6, 8, 12CH

Wiring Diagram

(2/2)

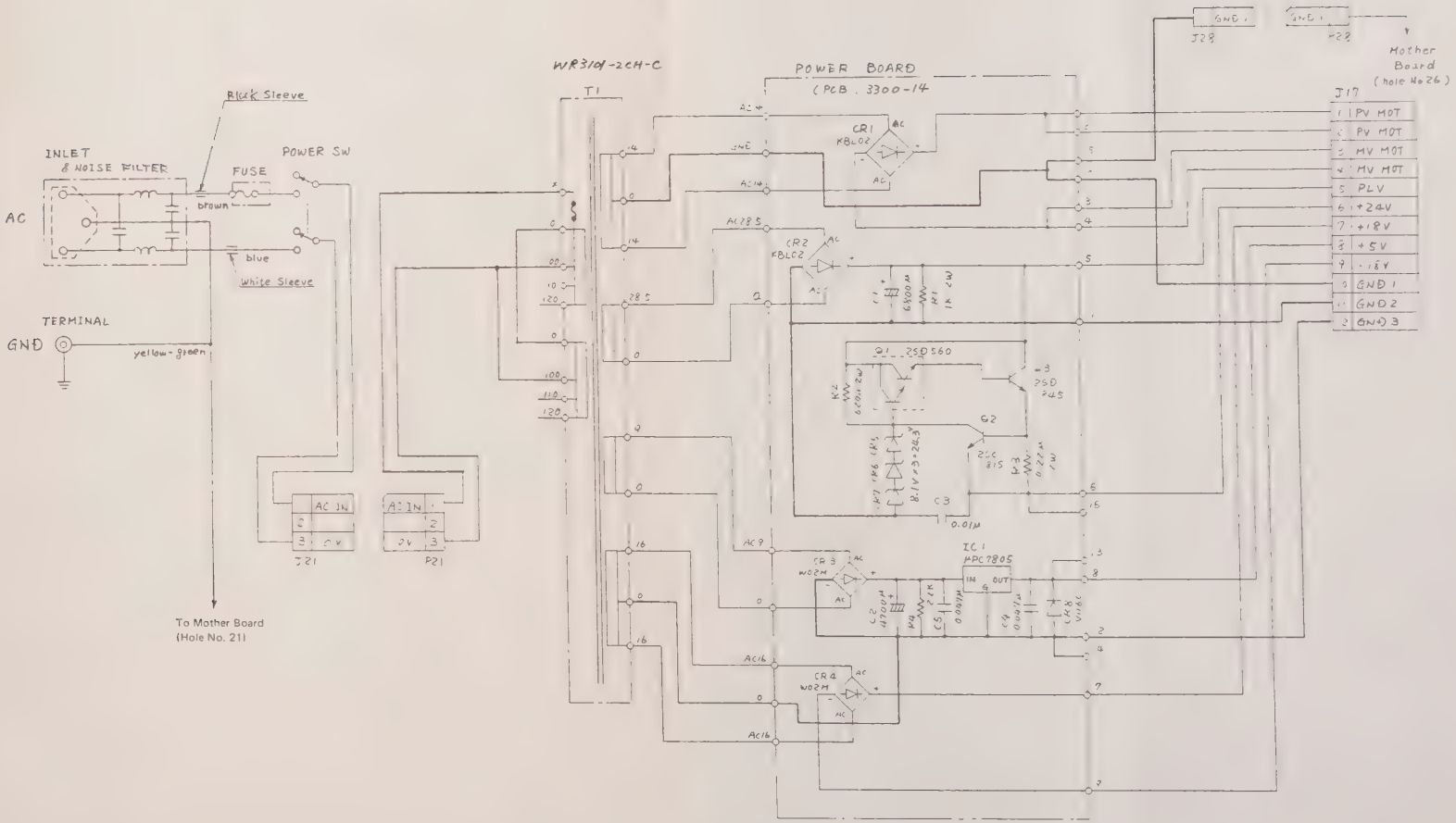
Figure	Part No.	Description		Type	Remarks
					8CH 12CH
B1	509600004	Fan Motor	AC100V	PXJ43B1	
B2	509410001	Stepping Motor		KP6R2-011	
B3	509100017	DC Motor, Coreless	DC24V	LN30-N21N1	
Cap	516100009	Cap.	Red	B101	For S1
F1	512300027	Fuse, Time Lag	4A	F102-SGA-4A	For 2CH, 4CH 6CH (AC100V, 17V)
F1	512300028	Fuse, Time Lag	6A	F102-SGA-6A	For 8CH, 12CH (AC100V, 117V)
F1	512300029	Fuse, Time Lag	2A	F102-SGA-2A	For 2CH, 4CH, 6CH (AC220V, 240V)
F1	512300031	Fuse, Time Lag	3A	F102-SGA-3A	For 8CH, 12CH (AC220V, 240V)
S-Bar	004407010	Shorting Bar			xCH
J1001	513200102	Connector Receptacle	1P	1625-1R-1	
PIN	513400002	Connector Pin		1855TL	For J1001
FC	520110060	Flat Cable, 30P-42mm		L42-30P-(A)	

5.2.2 Winding Circuit



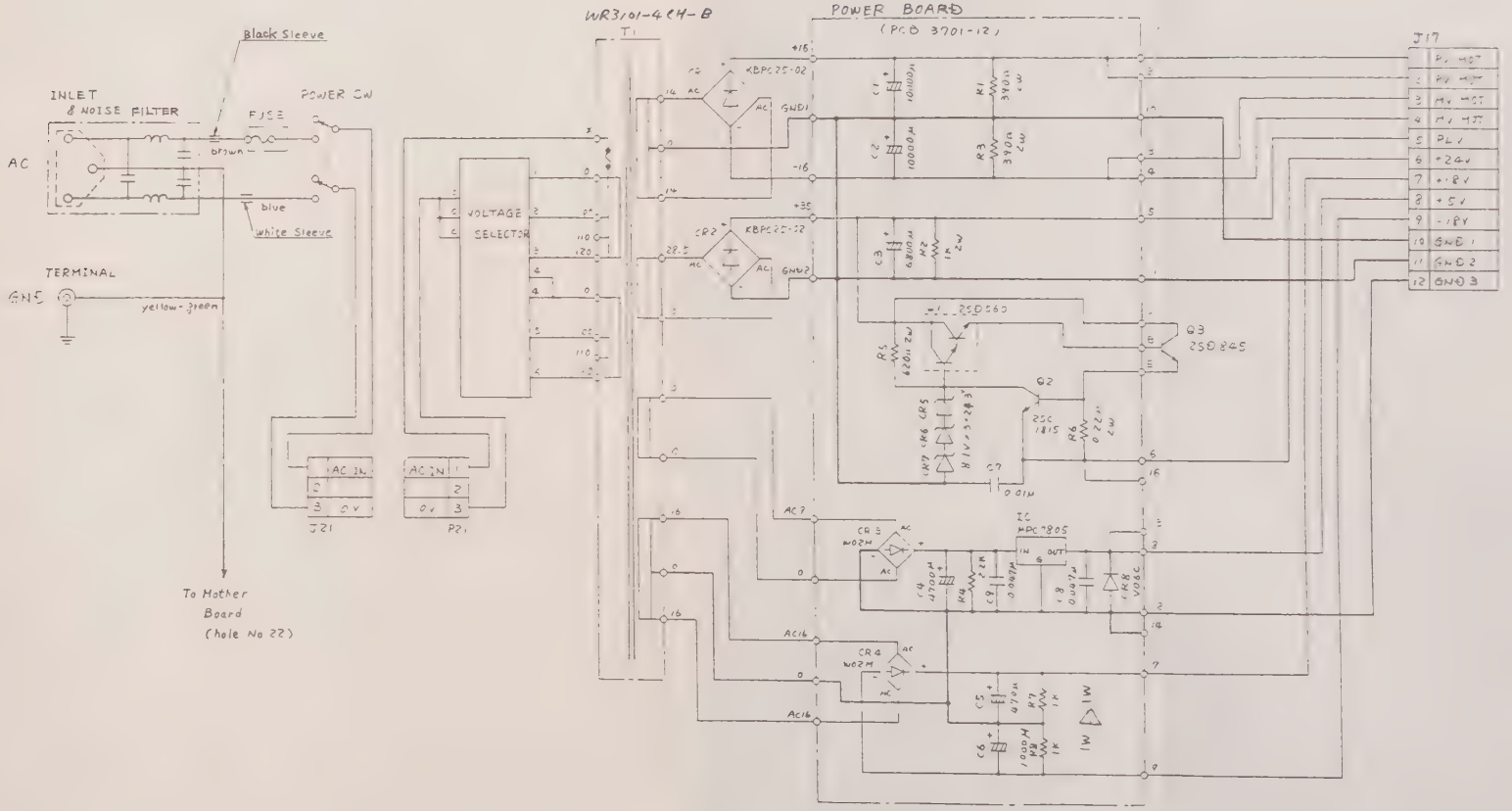
Winding Circuit

Figure	Part No.	Description	Type	Remarks
R1	501810410	R, Metal Film 10K 1/4W ±1%	RN1/4-10KF	
R2	501810475	R, Metal Film 75K 1/4W "	RN1/4-75KF	
R3	501810410	R, Metal Film 10K 1/4W "	RN1/4-10KF	
R4	501810347	R, Metal Film 4.7K 1/4W "	RN1/4-4.7KF	
R5	501810536	R, Metal Film 360K 1/4W "	RN1/4-360KF	
R6	501810410	R, Metal Film 10K 1/4W "	RN1/4-10KF	
R7	501810351	R, Metal Film 5.1K 1/4W "	RN1/4-5.1KF	
R8	501810427	R, Metal Film 27K 1/4W "	RN1/4-27KF	
R9	501810422	R, Metal Film 1.3K 1/4W "	RN1/4-22KF	
R10	501810422	R, Metal Film 22K 1/4W "	RN1/4-22KF	
R11	501605711	R, Metal Film 1 1W ±5%	RSFIB-1J	
R12	"	R, Metal Film 1 1W "	"	
R13	501810322	R, Metal Film 2.2K 1/4W ±1%	RN1/4-2.2KF	
R14	"	R, Metal Film " " "	"	
R15	"	R, Metal Film " " "	"	
C1	502303008	C, Mylar Film 0.022μ 50WV	MFL-05S22	
C2	502203002	C, Tantalum 10μ 16WV	CS15EIC100M	
C3	502103028	C, Electrolytic 47μ 35WV	SM35VB-47	
CR1	503100060	Di, Zener Vz=5.2V	WV052	
CR2	503100020	Di, Si VR=30V IF=100mA	1S953	
IC1	503300054	IC, Op-Amp Dual	NJM4558D	
S1	508401004	Switch, Micro	CC-5-R	
Q1	503203016	T, PNP –30V –100mA 200mW	2SA1015, Y	
Q2	503200027	T, N-J-FET	2SK30A	
Q3	503200028	T, NPN 100V 5A 1.5W	2SD560, L	
	520100012	Insulating Sheet	30B6001	For Q3
VR1	504207038	R, Trimmer Cermet 50K	TM10KPV50K	
B1	509100017	DC Motor, Coreless DC24V	LN30-N21N1	
P1	513200601	Connector, Plug 6P	1625-06P-1	
CNP	513400001	Contact Pin	1854-TL	For P1
P3	513400038	Connector, Pin Header 2P	HNC2-2.5P2DS	
J1	513200602	Connector, Receptacle 6P	1625-06R-1	
CNP	513400002	Contact Pin	1855-TL	For J1
J3	513400043	Connector, Receptacle 2P	HNC2-2.5S-2	
CNP	513400037	Contact Pin	HNC-2.5S-A	For J3
PCB	511310200	Printed Circuit Board	3101-20	


WR3104-2CH-C
POWER BOARD
(PCB. 3300-14)
T1
Black Sleeve
INLET
& NOISE FILTER
FUSE
POWER SW
AC
brown
blue
White Sleeve
TERMINAL
GND
yellow-green
To Mother Board
(Hole No. 21)
AC IN
J21
P21
CR1 KBL02
CR2 KBL02
CR3 W02M
CR4 W02M
Q1 2SD560
Q2 2SC815
IC1 μPC7805
IN
OUT
J28
Mother Board (hole No 26)
J17
1 PV MOT
2 PV MOT
3 MV MOT
4 MV MOT
5 PLV
6 +24V
7 +18V
8 +5V
9 -18V
10 GND1
11 GND2
12 GND3

Power Supply Unit (2CH)

Figure	Part No.	Description	Type	Remarks
P.C.B.	51330010	Printed Circuit Board	PR, 3300-14	
IC1	503300128	IC, Voltage Regulator	μPC7805H	
Q1	503200028	T, NPN 100V 5A 1.5W	2SD560-K	
Q2	503203014	T, NPN 30V 100mA 200mW	2SC1815, Y, X	
Q3	503203050	T, NPN 150V 12A 120W	2SD845, 0	
CR1	503103010	Diode Bridge	KBL02	
CR2	〃	〃	〃	
CR3	503100022	Diode Bridge 140VAC 1.5A	W02M	
CR4	〃	〃 〃 〃	〃	
CR5	503103031	Di, Zener 8.1V 1W ±5%	BZ081	
CR6	〃	〃 〃 〃 〃	〃	
CR7	〃	〃 〃 〃 〃	〃	
CR8	503100021	Di, Si VR=200V IF=1.1A	V06C	
R1	501606712	R, Metal Film 1K 2W ±5%	RSF2B-1KJ	
R2	501606720	R, 〃 620 〃 〃	RSF2B-620J	
R3	501606721	R, Wirewound 0.22 〃 〃	MU2-0.22J	
R4	501810322	R, Metal Film 2.2K 1/4W ±1%	RN1/4-2.2KF	
C1	502103193	C, Electrolytic 6800μ 50WV	ECES1HU682N	
C2	502103192	C, 〃 4700μ 〃	ECEA1CGE472	
C3	502303004	Mylar Film 0.01μ 〃	MFL-05S1	
C4	5023603005	C, Mylar Film 0.047μ 〃	MFL-05S47	
C5	〃	〃 〃 〃	〃	
	520100012	Insulating Sheet	30B6001	For IC1, Q1
	520100013	Insulating Washer	AC316A	For IC1, Q1
	520110093	Insulating Sheet	TO-3.4P	For Q3
T1	510310011	Transformer	WR3101-2CH-C	
P21	513200301	Connector, Receptacle	CN-1625-3P-1	
	513200001	Contact Pin	CNP-1854TL	For P21
J17	513201202	Connector, Receptacle	CN-1625-12R-1	
J28	513200102	〃 〃	CN-1625-1R-1	
	513400002	Contact Pin	CNP-1855TL	For J17, J28


WR3101-4CH-B
POWER BOARD
(PCB 3701-12)
Black Sleeve
INLET
& NOISE FILTER
FUSE
POWER SW
AC
brown
blue
white Sleeve
TERMINAL
GND
yellow-green
To Mother
Board
(hole No 22)
T1
VOLTAGE
SELECTOR
AC IN
J21
P21
KBPC25-02
KBPC25-32
CR1
CR2
CR3
CR4
W02M
Q1 2SD560
Q2 2SC1815
Q3 2SD825
IC1 MPC7805
J17
+16
-16
+35
GND1
GND2
AC7
AC16

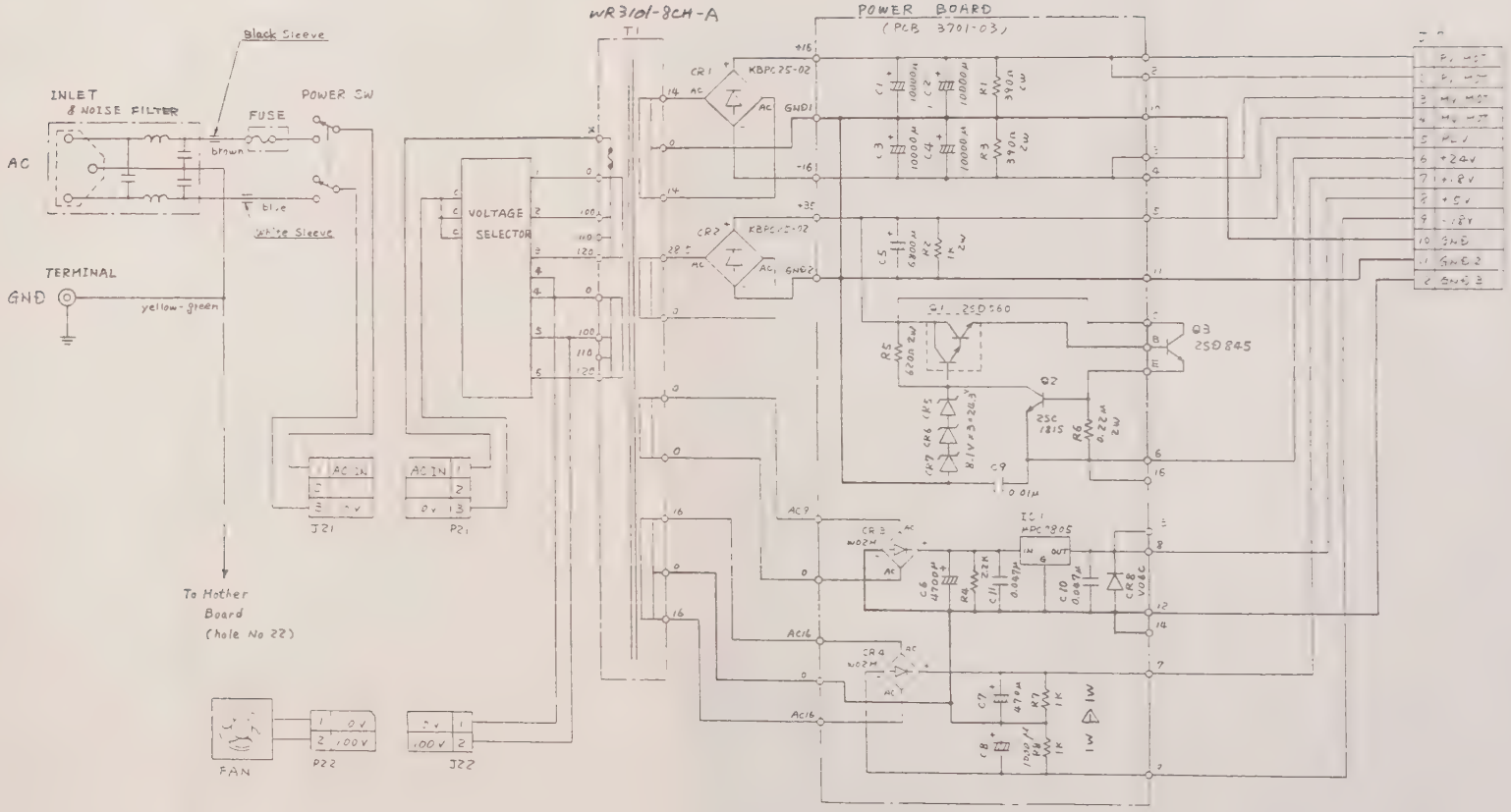
Power Supply Unit (4CH)

Figure	Part No.	Description	Type	Remarks
P.C.B.	511370120	Printed Circuit Board	PT, 3701-12	
IC1	503300128	IC, Voltage Regulator 5V	μPC7805H	
Q1	503200028	T, NPN 100V 5A 1.5W	2SD560, NEC	
Q2	503203014	T, NPN 30V 100mA 200mW	2SC1815, Y, X	
Q3	503203050	T, NPN 150V 12A 120W	2SD845, 0	
CR1	503103013	Diode Bridge	KBPC25-02	
CR2	"	"	"	
CR3	503100022	Diode Bridge 140VAC 1.5A	W02M	
CR4	"	" " "	"	
CR5	503103031	Di, Zener 8.1V 1W ±5%	BZ081	
CR6	"	" " " "	"	
CR7	"	" " " "	"	
CR8	503100021	Di, Si VR=200V IF=1.1A	V06C	
C1	502102018	C, Electrolytic 10000μ 35WV	ECET35R103SW	
C2	"	C, " " "	"	
C3	502102021	C, " 6800μ 50WV	ECET50R682SW	
C4	502102017	C, " 4700μ 16WV	ECEA1CS472	
C5	502503013	C, " 470μ 35WV	35ULB470-M	
C6	502102019	C, " 1000μ 35WV	ECEA1VS102	
C7	502303004	C, Mylar Film 0.01μ 50WV	MFL-05S1	
C8	502303005	C, " 0.047μ 50WV	MFL-05S47	
C9	"	C, " " "	"	
R1	501606711	R, Metal Film 390 2W ±5%	RSF2B-390J	
R2	501606712	R, " 1K " "	RSF2B-1KJ	
R3	501606711	R, " 390 " "	RSF2B-390J	
R4	501810322	R, " 2.2K " ±1%	RN1/4-2.2KF	
R5	501606720	R, " 690 " ±5%	RSF2B-620J	
R6	501606721	R, Wirewound 0.22 " "	MU2-0.22J	
R7	501604712	R, Metal Film 1K " "	RSF1B-1KJ	
R8	"	R, " " " " "	"	
T1	510310021	Transformer	WR3101-4CH-B	
	513501001	AC Selector	AC Selector 9208 Plug	
	513501002	"	AC Selector 9209 Socket	
P21	513200301	Connector, Receptacle	CN-1625-3P-1	

Power Supply Unit (4CH)

(2/2)

Figure	Part No.	Description	Type	Remarks
	513400001	Contact Pin	CNP, 1854TL	For P21
J17	513201202	Connector, Receptacle	CN-1625-12R-1	
	513400002	Contact Pin	CNP, 1855TL	For J17
	520100012	Insulating Sheet	30B6001	For J1, Q1
	520110093	"	T03, 4P	For Q3


WR3101-8CH-A
POWER BOARD
(PCB 3701-03)
T1
Black Sleeve
INLET
& NOISE FILTER
FUSE
POWER SW
AC
brown
blue
White Sleeve
TERMINAL
GND
yellow-green
VOLTAGE
SELECTOR
100
110
120
AC IN
J21
P21
To Mother
Board
(hole No 22)
FAN
P22
J22
CR1 KBPC25-02
CR2 KBPC25-02
GND1
GND2
+16
-16
+35
C1 10000μ
C2 10000μ
C3 10000μ
C4 10000μ
R1 390Ω 2W
R3 390Ω 2W
C5 4700μ
R2 1K 2W
Q1 2SD560
R5 6700Ω 2W
Q3 2SD845
Q2 2SC1815
R6 0.22Ω 2W
CR4 CR5 CR6 CR7 8.1V×3=24.3V
C9 0.01μ
IC1 μPC7805
IN OUT G
C6 4700μ
R4 22K
C11 0.047μ
C10 0.047μ
CR8 V06C
CR3 W02M
CR4 W02M
C7 470μ
R7 1K 1W
C8 1000μ
R8 1K 1W
P1 +24V
P2 +24V
M1 M2T
M2 M2T
FL1
+24V
+18V
+5V
-18V
GND
GND2
GND3

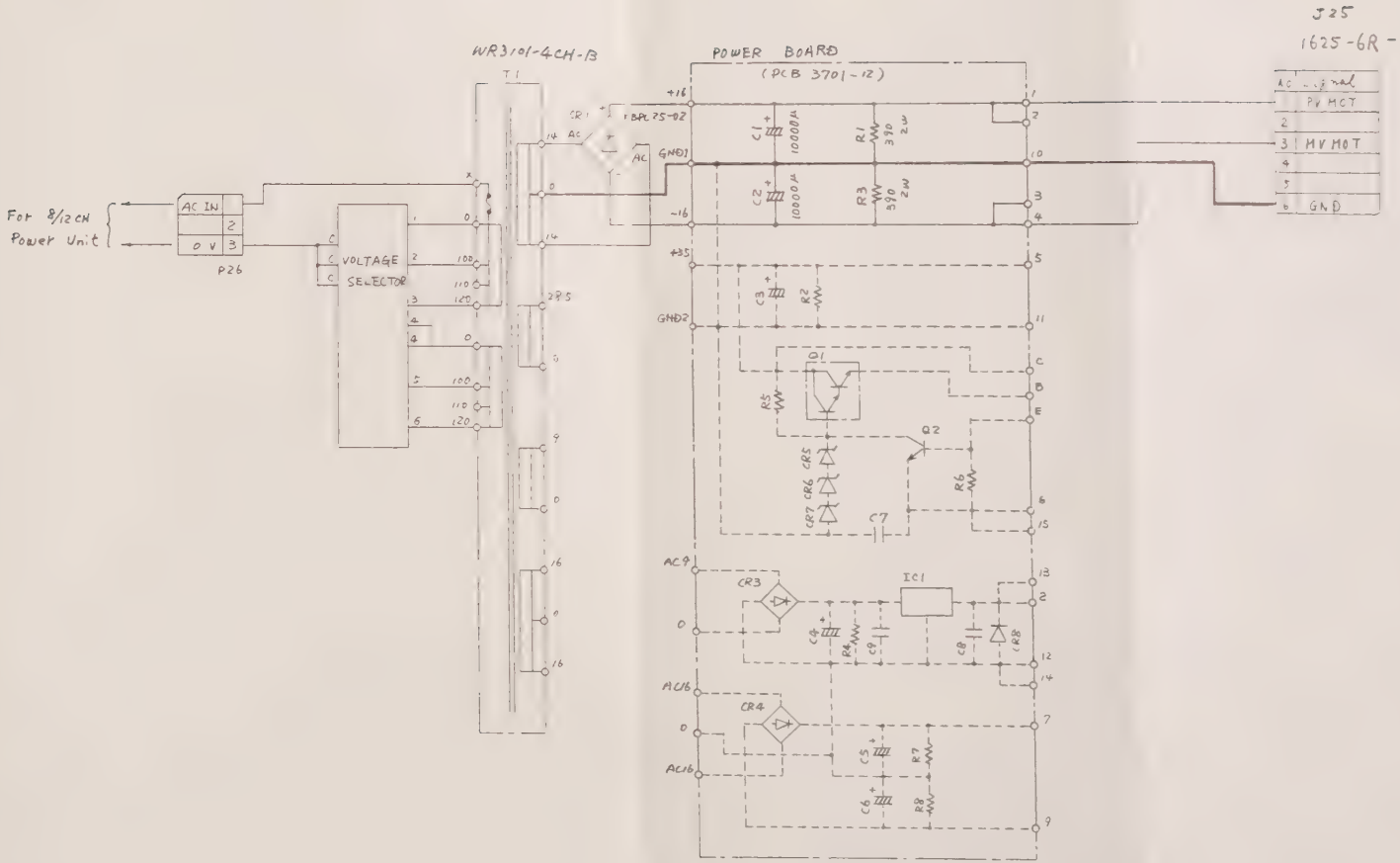
Power Supply Unit (6, 8CH)

Figure	Part No.	Description	Type	Remarks
P.C.B.	511370030	Printed Circuit Board	PR, 3701-03	
IC1	503300128	IC, Voltage Regulator 5V	μPC7805H	
Q1	503200028	T, NPN 100V 5A 1.5W	2SD560, NEC	
Q2	503203014	T, NPN 30V 100mA 200mW	2SC1815, Y, X	
Q3	503203050	T, NPN 150V 12A 120W	2SD845, 0	
CR1	503103013	Diode Bridge	KBPC25-02	
CR2	〃	〃	〃	
CR3	503100022	Diode Bridge 140VAC 15A	W02M	
CR4	〃	〃 〃 〃	〃	
CR5	503103031	Di, Zener 8.1V 1W ±5%	BZ081	
CR6	〃	〃 〃 〃 〃	〃	
CR7	〃	〃 〃 〃 〃	〃	
CR8	503100021	Di, Si VR=200V IF=1.1A	V06C	
C1	502102018	C, Electrolytic 10000μ 35WV	ECET35R103SW	
C2	〃	C, 〃 〃 〃	〃	
C3	〃	C, 〃 〃 〃	〃	
C4	〃	C, 〃 〃 〃	〃	
C5	502102021	C, 〃 6800μ 50WV	ECET50R682SW	
C6	502102017	C, 〃 4700μ 16WV	ECEA1CS472	
C7	502503013	C, 〃 470μ 35WV	35ULB470-M	
C8	502102019	C, 〃 1000μ 35WV	ECEA1VS102	
C9	502303004	C, Mylar Film 0.01μ 50WV	MFL-05S1	
C10	502303005	C, 〃 0.047μ 50WV	MFL-05S47	
C11	〃	C, 〃 〃 〃	〃	
R1	501606711	R, Metal Film 390 2W ±5%	RSF2B-390J	
R2	501606712	R, 〃 1K 〃 〃	RSF2B-1KJ	
R3	501606711	R, 〃 390 〃 〃	RSF2B-390J	
R4	501810322	R, 〃 2.2K 1/4W ±1%	RN1/4-2.2KF	
R5	501606720	R, 〃 620 2W ±5%	RSF2B-620F	
R6	501606721	R, Wirewound 0.22 〃 〃	MU2-0.22J	
R7	501604712	R, Metal Film 1K 1W 〃	RSF1B-1KJ	
R8	〃	R, 〃 〃 〃 〃	〃	
T1	510310031	Transformer	WR3101-8CH-A	
	513501001	AC Selector	AC Selector 9208 Plug	
	513501002	〃	AC Selector 9209 Socket	

Power Supply Unit (6, 8CH)

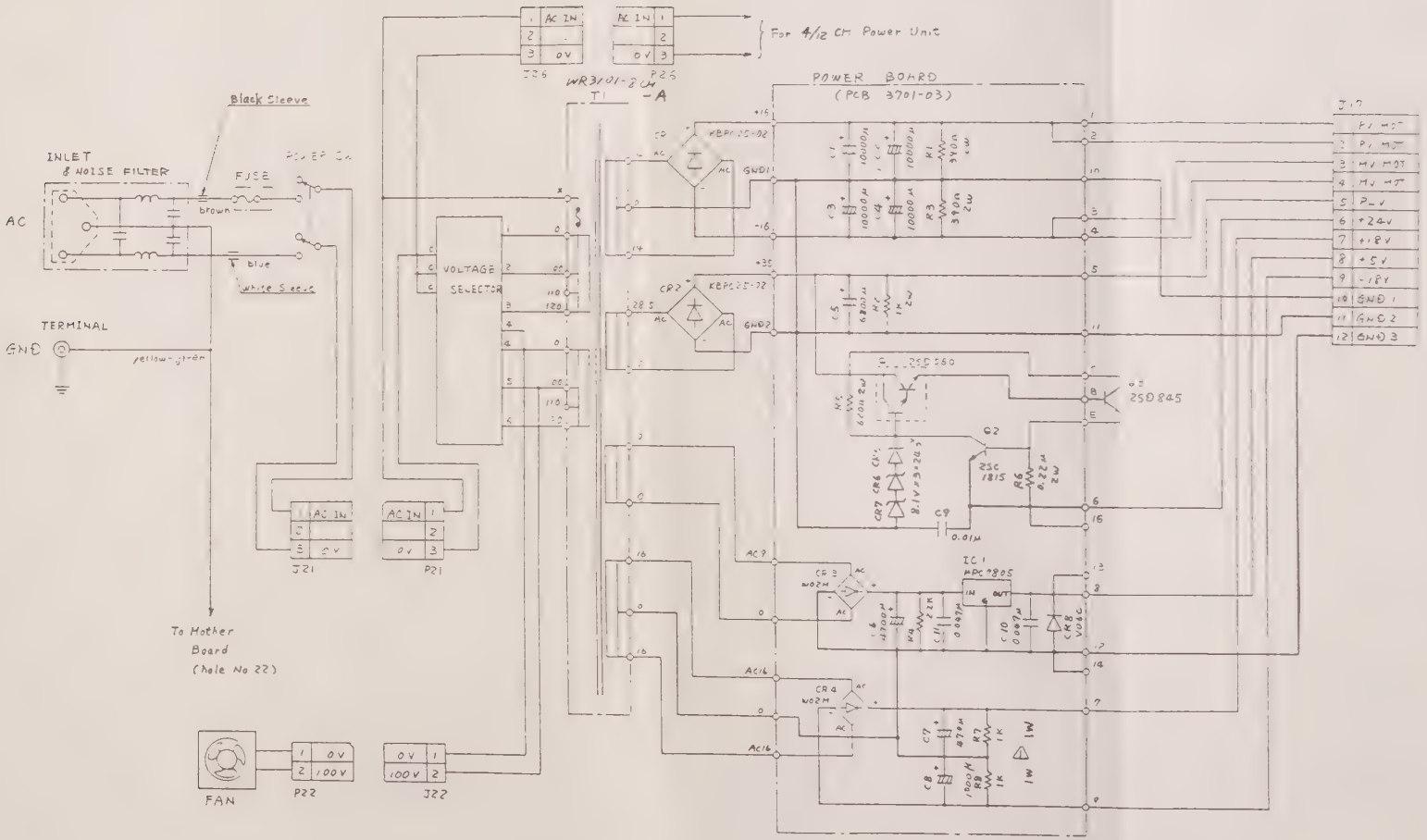
(2/2)

Figure	Part No.	Description	Type	Remarks
J17	513201202	Connector, Receptacle	CN-1625-12R-1	
J22	513200203	" "	CN-1625-2R-1	
	513400002	Contact Pin	CNP-1855TL	For J17, J22
P21	513200301	Connector, Receptacle	CN-1625-3P-1	
	513400001	Contact Pin	CNP-1854TL	For P21
	520100012	Insulating Sheet	30B6001	For IC1, Q1
	520110093	"	T0-3, 4P	For Q3


WR3101-4CH-B
POWER BOARD
(PCB 3701-12)
J25
1625-6R-1
For 8/12CH
Power Unit
AC IN
P26
VOLTAGE
SELECTOR
T1
CR1
BRL25-02
+16
GND1
-16
+35
GND2
C1
C2
C3
R1
R2
R3
Q1
Q2
R5
R6
CR5
CR6
CR7
C7
IC1
CR3
CR4
C4
C5
C6
C8
C9
R4
R7
R8
CR8
AC9
AC16
PW MOT
MV MOT
GND

Power Supply Unit (4/12CH)

Figure	Part No.	Description	Type	Remarks
P.C.B.	511370120	Printed Circuit Board	PR, 3701-12	
CR1	503103013	Diode Bridge	KBPC25-02	
C1	502102018	C, Electrolytic 10000μ 35WV	ECET35R103SW	
C2	"	C, " " "	"	
R1	501606711	R, Metal Film 390 2W ±5%	RSF2B-390F	
R3	"	R, " " " "	"	
T1	510310021	Transformer	WR3101-4CH-B	
	513501001	AC Selector	AC Selector 9208 Plug	
	513501002	"	AC Selector 9209 Socket	
P26	513200301	Connector, Receptacle	CN-1625-3P-1	
	513400021	Contact Pin	CNP-1560TL	For P26
J25	513200602	Connector, Receptacle	CN-1625-6R-1	
	513400002	Contact Pin	CNP-1855TL	For J25

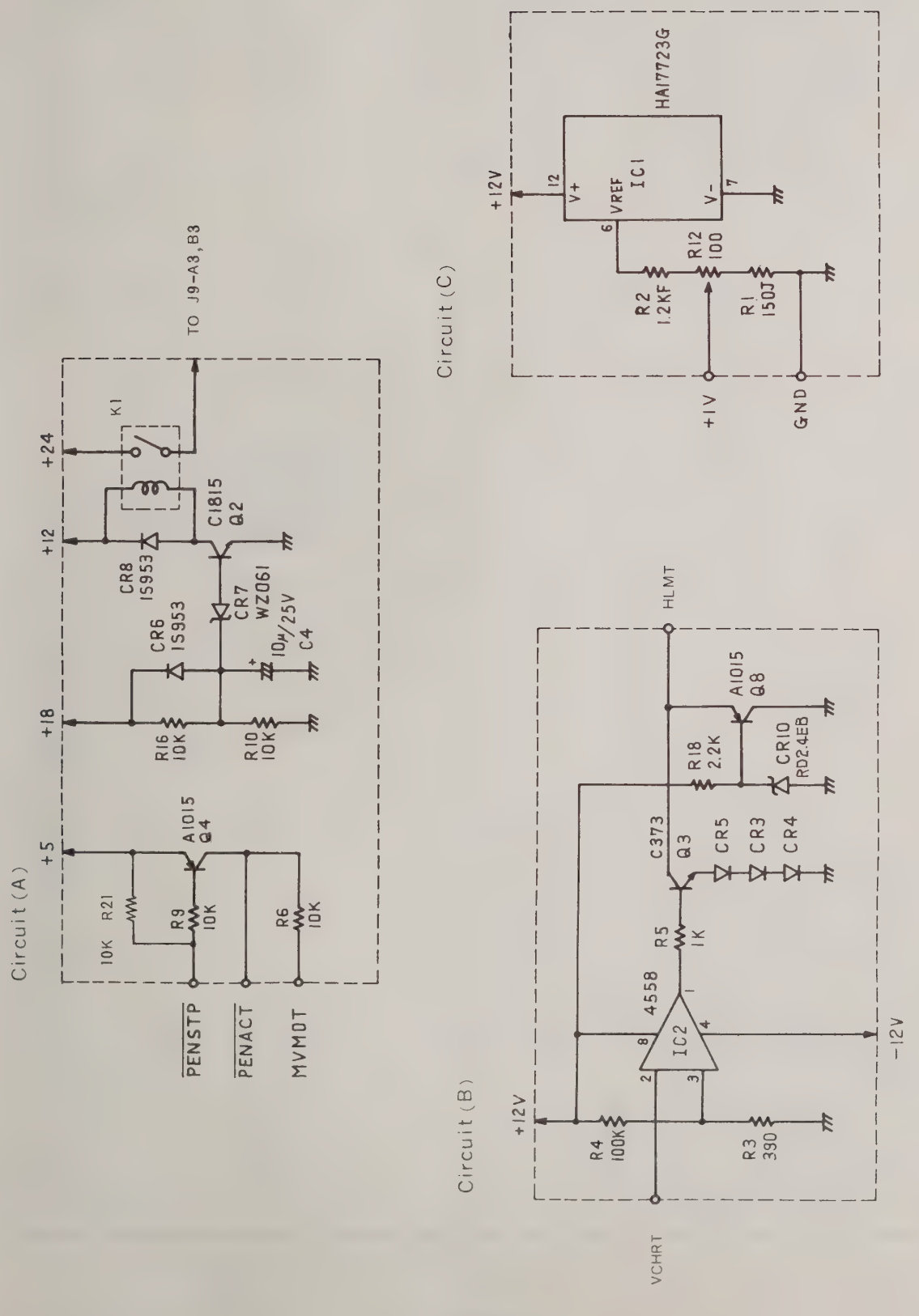

Black Sleeve
INLET
& NOISE FILTER
FUSE
AC
brown
blue
White Sleeve
TERMINAL
GND
yellow-green
To Mother
Board
(hole No 22)
FAN
P22
J22
J21
P21
J25
P25
AC IN
0V
100V
For 4/12 CH Power Unit
WR3101-2CW
T1
-A
POWER BOARD
(PCB 3701-03)
VOLTAGE
SELECTOR
110
120
CR1
KBPC25-02
CR2
KBPC25-12
2SD560
2SD845
Q2
2SC
1815
IC1
μPC7805
J17
F1 MOT
P1 MOT
MV MOT
MV MOT
P_V
+24V
+18V
+5V
-18V
GND 1
GND 2
GND 3

Power Supply Unit (8/12CH)

Figure	Part No.	Description	Type	Remarks
P.C.B.	511370030	Printed Circuit Board	PR, 3701-03	
IC1	503300128	IC, Voltage Regulator 5V	μPC7805H	
Q1	503200028	T, NPN 100V 5A 1.5W	2SD560, NEC	
Q2	503203014	T, NPN 30V 100mA 200mW	2SC1815, Y, X	
Q3	503203050	T, NPN 150V 12A 120W	2SD845, 0	
CR1	503103013	Diode Bridge	KBPC25-02	
CR2	〃	〃	〃	
CR3	503100022	Diode Bridge AC140V 15A	W02M	
CR4	〃	〃 〃 〃	〃	
CR5	503103031	Di, Zener 8.1V 1W ±5%	BZ081	
CR6	〃	Di, 〃 〃 〃 〃	〃	
CR7	〃	Di, 〃 〃 〃 〃	〃	
CR8	503100021	Di, Si VR=200V IF=1.1A	V06C	
C1	502102018	C, Electrolytic 10000μ 35WV	ECET35R103SW	
C2	〃	C, 〃 〃 〃	〃	
C3	〃	C, 〃 〃 〃	〃	
C4	〃	C, 〃 〃 〃	〃	
C5	502102021	C, 〃 6800μ 50WV	ECET50R682SW	
C6	502102017	C, 〃 4700μ 16WV	ECEA1CS472	
C7	502503013	C, 〃 470μ 35WV	35ULB470-M	
C8	502102019	C, 〃 1000μ 〃	ECEA1VS102SW	
C9	502303004	C, Mylar Film 0.01μ 50WV	MFL-05S1	
C10	502303030	C, Electrolytic 0.047μ 〃	ECQM1H473JF	
C11	〃	C, 〃 〃 〃	〃	
R1	501606711	R, Metal Film 390 2W ±5%	RSF2B-390J	
R2	501606712	R, 〃 1K 〃 〃	RSF2B-1KJ	
R3	501606711	R, 〃 390 〃 〃	RSF2B-390J	
R4	501810322	R, 〃 2.2K 1/4W ±1%	RN1/4-2.2KF	
R5	501606720	R, 〃 620 2W ±5%	RSF2B-620J	
R6	501606721	R, Wirewound 0.22 〃 〃	MU2-0.22J	
R7	501604712	R, Metal Film 1K 1W 〃	RSF1B-1KJ	
R8	〃	R, 〃 〃 〃 〃	〃	
T1	510310031	Transformer	WR3101-8CH-A	
	513501001	AC Selector	AC Selector 9208 Plug	
	513501002	〃	AC Selector 9209 Socket	

Power Supply Unit (8/12CH)

Figure	Part No.	Description	Type	Remarks
J26	513200302	Connector, Receptacle	CN-1625-3R	
	513400022	Contact Pin	CNP, 1561TL	For J26
P21	513200301	Connector, Receptacle	CN-1625-3P-1	
	513400001	Contact Pin	CNP, 1854	For P21
J17	513201202	Connector, Receptacle	CN-1625-12R-1	
	513400002	Contact Pin	CNP-1855TL	For J17, J22
J22	513200203	Connector, Receptacle	CN-1625-2R-1	
	520100012	Insulating Sheet	30B6001	For IC1, Q1
	520110093	"	T0-3.4P	For Q3


Circuit (A)
+5
+18
+12
+24
TO J9-A3,B3
K1
C1815
Q2
CR8
IS953
CR6
IS953
CR7
WZ061
10μ/25V
C4
R16
10K
R10
10K
A1015
Q4
10K R21
R9
10K
R6
10K
PENSTP
PENACT
MVMOT
Circuit (C)
+12V
12
V+
VREF
IC1
V-
7
6
HA17723G
R2
1.2KF
R12
100
R1
150J
+1V
GND
Circuit (B)
HLMT
A1015
Q8
R18
2.2K
CR10
RD2.4EB
C373
Q3
CR5
CR3
CR4
R5
1K
4558
IC2
+12V
-12V
R4
100K
R3
390
VCHRT

Mother Board

(1/3)

Figure	Part No.	Description				Type	Remarks
R1	501443721	R, Metal Film	150	1/4W	±5%	RP42C-150J	
R2	501443503	R, "	1.2K	1/4W	±1%	RP42C-1.2KF	
R3	501810239	R, "	390	1/4W	"	RN1/4-390F	
R4	501810510	R, "	100K	1/4W	"	RN1/4-100KF	
R5	501810316	R, "	1K	1/4W	"	RN1/4-1KF	
R6	501810410	R, "	10K	1/4W	"	RN1/4-10KF	
R7	501105707	R, Carbon	330	1W	±5%	ERG1AN1331	
R8	"	R, "	"	"	"	")	For 2, 4CH
R9	501810410	R, Metal Film	10K	1/4W	±1%	RN1/4-10KF	
R10	501810410	R, "	"	"	"	RN1/4-10KF	
R12	501203721	R, Trimmer, Cermet	100			RJ6P-100	
R16	501810410	R, Metal Film	10K	1/4W	±1%	RN1/4-10KF	
R18	501810322	R, "	2.2K	"	"	RN1/4-2.2KF	
R13'	501810347	R, "	4.7K	1/4W	±1%	RN1/4-4.7KF	For 2CH
R14'	"	R, "	"	"	"	"	"
R15'	501606711	R, "	390	2W	±5%	RSF2B-390J	"
R16'	"	R, "	"	"	"	"	"
R20	501810222	R, "	220	1/4W	±1%	RN1/4-220F	
R21	501810410	R, "	10K	"	"	RN1/4-10KF	
C4'	502102015	C, Electrolytic	6800μ	35WV		ECET35R682SW	For 2CH
C5'	"	C, "	6800μ	"		"	"
C6'	502102016	C, "	470μ	35WV		ECEA1VS471	For 2CH
C7'	"	C, "	"			"	"
C1-X	502601003	C, Oil	0.047μ	630WV		PMA-2J-473	xCH
C2	502103128	C, Electrolytic	10μ	25WV		ECEA1EU100	
C3	"	C, "	"	"		"	
C4	"	C, "	"	"		"	
C8	502303005	C, Metal Film	0.047μ	50WV		MFL-05S47	
CR1	503100021	Di, Si	VR=200V	IF=1.1A		V06C	
CR2	"	Di, "	"	"		"	
CR3	503100020	Di, "	VR=30V	IF=0.1A		1S953	
CR4	"	Di, Si	"	"		"	
CR5	"	Di, "	"	"		"	
CR6	"	Di, "	"	"			
CR7	503100001	Di, Zener	6.1V	0.5W	±5%	WZ061	
CR8	503100020	Di, Si	VR=30V	IF=0.1A		1S953	
CR10	503100159	Di, Zener	2.4V	0.5W	±5%	RD2.4EB	'86, 10 (for Pen)
IC1	503300117	IC, Voltage Regulator				HA177223G	
IC2	503300054	IC, Op-Amp Dual				μPC4558C	
IC3	503300115	IC, Voltage Regulator				UPC7912H	
IC4	503300116	IC, "				UPC7812H	

Mother Board

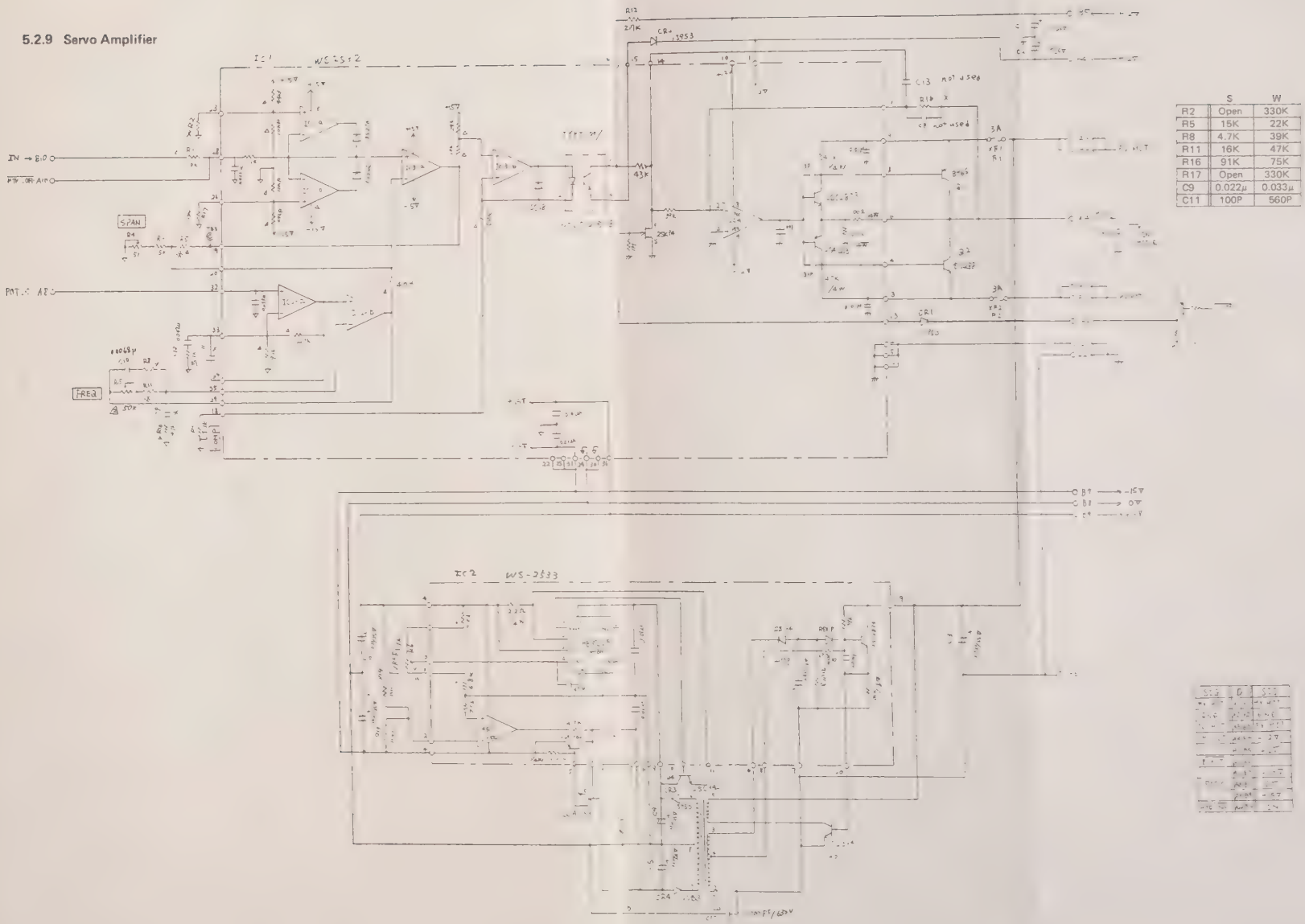
Figure	Part No.	Description	Type	Remarks
Q2	503103014	T, NPN 30V 100mA 200mW	2SC1815, Y	2SC373
	503103014	T, NPN 30V 100mA 200mW	2SC1815, Y	2SC373
Q4	503203016	T, NPN −30V −100mA 200mV	2SA1015, Y	2SA495
Q8	"	T, " " " "	"	"
J8-X	513300604	Connector 10Px2	225J21021-487	xCH
J9-X	"	" "	"	xCH
J10-X	"	" "	"	xCH
P11	513400040	Connector, Pin Holder 10P	HNC2-2.5P10DS	
P12	513400039	" 3P	HNC2-2.5P3DS	
P13	"	" 2P	"	
P14	513400038	" 2P	HNC2-2.5P2DS	
P17	513201201	Connector, Plug 12P	1625-12P-1	
CNP	513400001	Contact Pin	1854TL	x12, For P17
P26	513200202	Connector, Plug 2P	1625-2P-1	x2, For P26
CNP	513400001	Contact Pin	1854TL	For 2CH
K1	515100004	Relay DC12V 360Ω	MZ12H	
PCB	511310180	Printed Circuit Board	3101-18B	For 2CH
PCB	511310150	"	3101-15B	For 4CH
PCB	511310190	"	3101-19A	For 6CH
PCB	511310010	"	3101-01C	For 8CH
PCB	511310160	"	3101-16B	For 12CH
PCB	511310170	"	3101-17B	
BB1	514200309	Bus Bar 135mm, with Tube	T115-45-135I	
BB2	"	" " "	"	For 4CH, 12CH
BB3	514200310	" " "	T115-45-135	
BB1	514200313	Bus Bar 225mm, with Tube	T115-45-225I	
BB2	"	" " "	"	For 6CH
BB3	514200314	" " "	T115-45-225	
BB1	514200311	Bus Bar 315mm, with Tube	T115-45-315I	
BB2	"	" " "	"	For 8CH, 2CH
BB3	514200312	" " "	T115-45-315	
BB1	514200307	Bus Bar 45mm, with Tube	T115-45-45I	
BB2	"	" " "	"	For 2CH
BB3	514200308	" " "	T115-45-45	

Mother Board

(3/3)

Figure	Part No.	Description	Type	Remarks
P25	513200601	Connector, Plug 6P	1625-6P-1	For 12CH
CNP	513400001	Contact Pin	1854TL	x3

5.2.9 Servo Amplifier



	S	W
R2	Open	330K
R5	15K	22K
R8	4.7K	39K
R11	16K	47K
R16	91K	75K
R17	Open	330K
C9	0.022μ	0.033μ
C11	100P	560P

Servo Amplifier

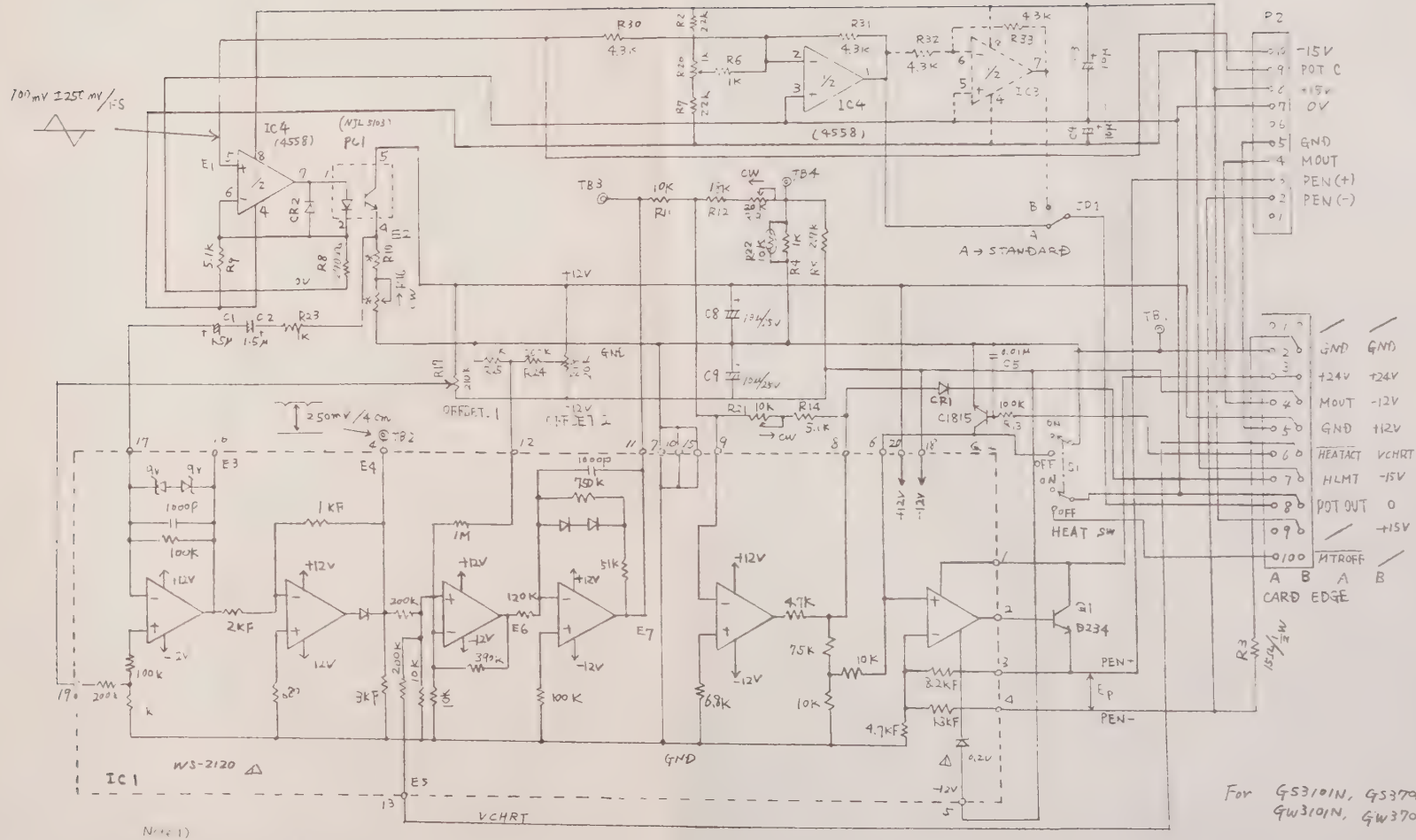
(1/2)

Figure	Part No.	Description				Type	Remarks
IC1	503304014	IC, Hybrid				WS-2532	
IC2	503304015	IC, "				WS-2533	
Q1	503203053	T, PNP	–80V	–5A	60W	2SB965Q	
Q2	503203054	T, NPN	80V	5A	60W	2SD1288Q	
Q3	503203070	T, NPN	100V	7A	40W	2SC2334	
Q4	503200011	T, NPN	50V	1A	1W	2SC3421, O	
Q5	503200003	T, PNP	–50V	–1A	"	2SA1358, Y	
CR1~4	503100020	Di, Si	VR=30V	IF=100mA		1S953	
R1	501810410	R, Metal Film	10K	1/4W	±1%	RN1/4-10KF	
R2	501810533	R, "	330K	"	"	RN1/4-330KF	For GW3310
R3	501810315	R, "	1.5K	"	"	RN1/4-1.5KF	
R4	504207048	R, Trimmer Cermet	5K			TM10KPH-5K	
R5	501810415	R, Metal Film	15K	"	"	RN1/4-15KF	For GS3310
"	501810422	R, "	22K	"	"	RN1/4-22KF	For GW3310
R6	505102036	R, Trimmer, Cermet	1K			GF06P-1K	
R7	501810310	R, Metal Film	1K	1/4W	±1%	RN1/4-1KF	
R8	501810347	R, "	4.7K	"	"	RN1/4-4.7KF	For GS3310
"	501810439	R, "	39K	1/4W	±1%	RN1/4-39KF	For GW3310
R9	504207049	R, Trimmer, Cermet	1K			TM10KPH-1K	
R10	501810347	R, Metal Film	4.7K	1/4W	±1%	RN1/4-4.7KF	
R11	501810416	R, "	16K	"	"	RN1/4-16KF	For GS3310
"	501810447	R, "	47K	"	"	RN1/4-47KF	For GW3310
R12	501810327	R, "	2.7K	"	"	RN1/4-2.7KF	
R13, 14	501303307	R, "	10K	"	±0.25%	RNE1/4-10KC	
R15	504207051	R, Trimmer, Cermet	50K			TM10KPH-50K	
R16	501810491	R, Metal Film	91K	1/4W	±1%	RN1/4-91KF	For GS3310
"	501810475	R, "	75K	"	"	RN1/4-75KF	For GW3310
R17	501810533	R, "	330K	"	"	RN1/4-330KF	For GW3310
C1~3	502103173	C, Electrolytic	10μF	25WV		ECEA1EG100S	
C4, 5	502103174	C, "	33μF	"		ECEA1EG330S	
C6, 7	502103173	C, "	10μF	"		ECEA1EG100S	
C9	502303008	C, Mylar Film	0.022μ	50WV		MFL-05S22	For GS3310
"	502303009	C, "	0.033μ	"		MFL-05S33	For GW3310
C10	502303013	C, "	0.068μ	"		MFL-05D68	
C11	502403009	C, Ceramic	100P	"		ROU04B101K-L05AC	For GS3310
"	502403086	C, "	560P	50WV		USD04-SL-561K	For GW3310
C12	502303005	C, "	0.047μ	"		MFL-05S47	
C101	502901027	C, "	0.001μ	50WV		ECQ-F6102KZ	For GW3310
F1, 2	512300015	Fuse	3A			MZ-3A	
For F1, 2	512400008	Fuse Holder				OG751-0056	

Servo Amplifier

(2/2)

Figure	Part No.	Description	Type	Remarks
TB1~3	513400027	Test Terminal	LC-1-G	
T1	510662030	Transformer	GE0322T	
For Q1, 2	040017200	Isolation Sheet	S-34	
For Q3	520100012	Insulating Sheet	30B6001	
PCB	511310041	Printed Circuit Board	3101-04E	3101-04E



	S	W
R10	470Ω	1k
R16	1K	2K

TB3 = -1.25V at 10cm/s
-3.3V at 100cm/s

For GS3101N, GS3701N, GS3310
GW3101N, GW3701N, GW3310

Heat Control Circuit (PCB: 3101-06F)

Figure	Part No.	Description				Type	Remarks
R2	501810422	R, Metal Film	22K	1/4W	±1%	RN1/4-22KF	'85, 10~
R3	501304701	R, "	15K	1/2W	±5%	RN1/2-15K	
R4	501810310	R, "	1K	1/4W	±1%	RN1/4-1KF	
R5	501810327	R, "	2.7K	"	"	RN1/4-2.7KF	
R6	501810310	R, "	1K	"	"	RN1/4-1KF	
R7	501810422	R, "	22K	"	"	RN1/4-22KF	
R8	501810227	R, "	270K	"	"	RN1/4-270F	
R9	501810351	R, "	5.1K	"	"	RN1/4-5.1KF	
R11	501810410	R, "	10K	"	"	RN1/4-10KF	
R12	501810418	R, "	18K	"	"	RN1/4-18KF	
R13	501810510	R, "	100K	"	"	RN1/4-100KF	
R14	501810351	R, "	5.1K	"	"	RN1/4-5.1KF	
R17	504207031	R, Trimmer	20K			TM10KPH-20K	
R18	"	R, "	"			"	
R19	505103023	R, Trimmer, Cermet	"			RJ6X-20K	
R20	505103011	R, "	1K			RJ6X-1K	
R21	504103021	R, Variable Carbon	10K			RC16YP20SB10K	
R22	503400005	R, Thermistor				10KD7-15%	
R23	501810310	R, Metal Film	1K	1/4W	±1%	RN1/4-1KF	
R24	501810520	R, "	200K	"	"	RN1/4-200KF	
R25	501810410	R, "	10K	"	"	RN1/4-10KF	
R30	501810343	R, "	4.3K	"	"	RN1/4-4.3KF	
R31	"	R, "	"	"	"	"	
C1	502203024	C, Tantalum	1.5μ	16WV		CS15E1C1R5M	
C2	"	R, "	"	"		"	
C3	502103128	C, Electrolytic	10μ	25WV		ECEA1EU100	
C4	"	C, "	"	"		"	
C5							
CR1	503100020	Di, Si	VR=30V	IF=0.1A		1S953	
CR2	"	Di, "	"	"		"	
IC1	503301152	IC, Hybrid				WS-1801	
IC4	503300025	IC, Op-Amp	Dual			UPC4558C	
S1	508102015	Switch, Toggle				3T201N-R1A	
TB1	513400027	Test Terminal				LC-1-G	
TB2	"	"				"	
TB3	"	"				"	
PCB	511310060	Printed Circuit Board					3101-06F

Heat Control Circuit (PCB: 3101-06F)

Figure	Part No.	Description	Type	Remarks
PC1	503300108	Photocoupler IF=70mA IC=100mA 60% < CTR < 150%	NJL512D-B	
Q1	503200015	T, NPN 3A 60A 1.5W	2SD234, O	
Q2	503203014	T, " 30V 100mA 200mW	2SC1815, Y	2SC373
J1	513200201	Connector, Socket 2P	S-10320	
P2	513400049	Connector, Pin Header 7P	HNC-2-2.5P.7DS	
J2	513400047	Connector, Receptacle 7P	HNC-2-2.5S7	
CNP	513400042	Contact Pin	HNC-2.5S-B	x6, For J2
	520100012	Insulating Sheet	30B6001	
	520100013	Insulating Washer	AC316A	
R10	501810247	R, Metal Film 470 1/4W ±1%	RN1/4-470F	
R16	505103711	R, Trimmer, Cermet 1K	RJ6X-1K	

5.2.11 Chart Controller Unit

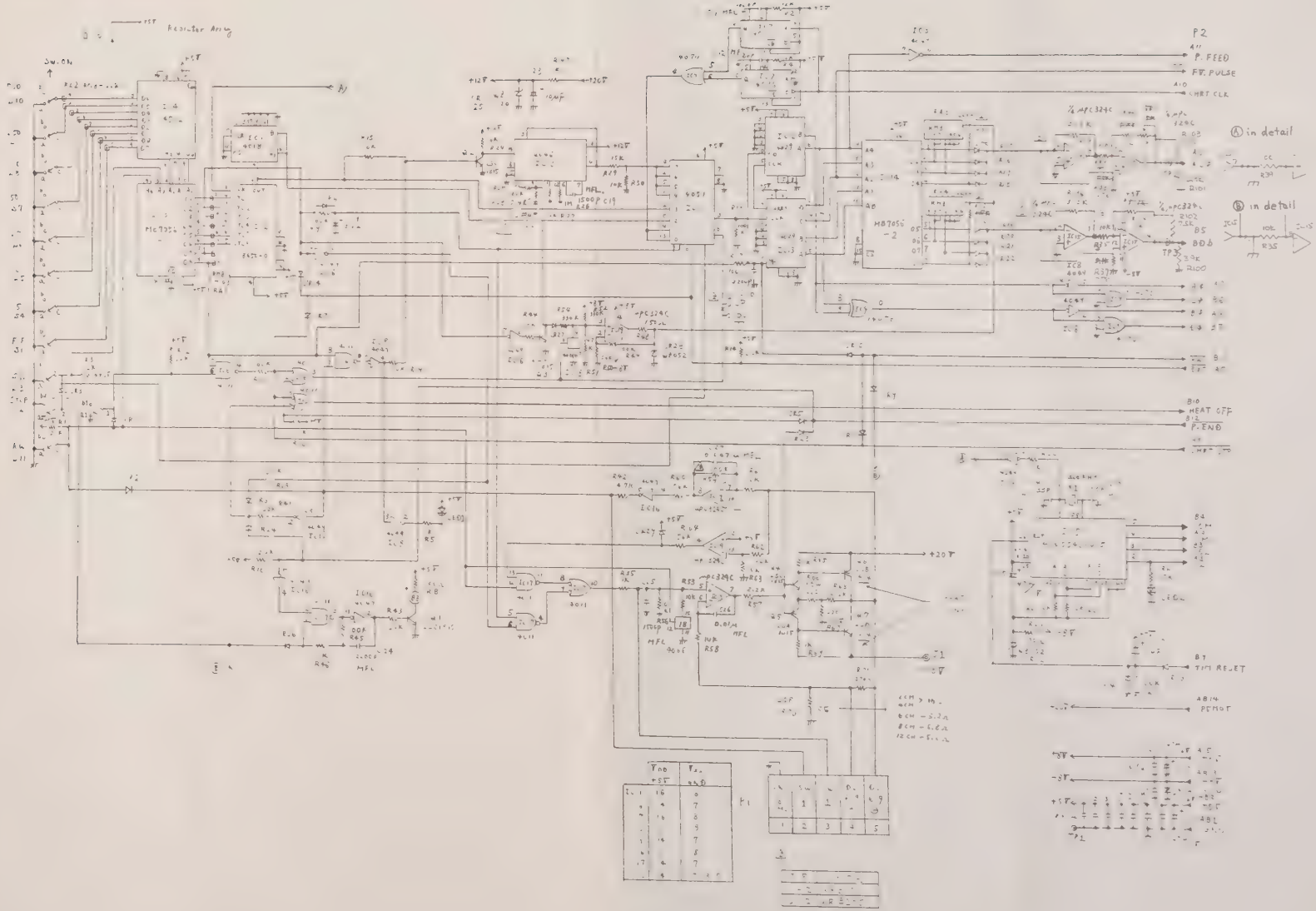


Chart Controller (3300-40)

Figure	Part No.	Description	Type	Remarks
IC1	503300119	IC, CMOS Divide-By-N Counter	TC4018BP	
IC2	503300100	IC, CMOS Programmable-Divider	8650-0	
IC3	503302051	IC, NMOS Bipolar Memory	MB7056-1	
IC4	503300118	IC, CMOS Encoder	TC4532BP	
IC5	503300049	IC, PMOS Microcomputer	μPD554C-015	
IC6	503300062	IC, CMOS Quad 2 In-Nand	TC4011BP	
IC7	503301035	IC, CMOS MONO MULTI	HD14538B	
IC8	503300094	IC, CMOS Hex Inverting Buffer	TC4049BP	
IC9	503302050	IC, CMOS Quad Exclusive-OR	HD14070B	
IC10	503302049	IC, CMOS Phase Locked Loop	HD14046B	
IC11	503300113	IC, CMOS 8CH Multiplexer	TC4051BP	
IC12,13	503300107	IC, CMOS Binary U/D Counter	TC4029BP	
IC14	503302052	IC, NMOS Bipolar Memory	MB7056-2	
IC15	503301009	IC, Op Amp Quad	μPC324C	
IC16	503300094	IC, CMOS Hex Inverting Buffer	TC4049BP	
IC17	503300062	IC, CMOS Quad 2 In-Nand	TC4011BP	
IC18	503300052	IC, CMOS Quad Bilateral Switch	TC4066BP	
IC19	503301009	IC, Op Amp Quad	μPC324C	
Q1~4	503203014	T, NPN 30V 100mA 200mW	2SC1815, Y	
Q5	503203016	T, NPN −30V −100mA 200mW	2SA1015, Y	
Q6	503200007	T, PNP −50V −3A 1.5W	2SB434, O	
Q7	5032000015	T, NPN 50V 3A 1.5W	2SD234, O	
CR1~11	503100020	Di, Si VR=30V IF=100mA	1S953	
CR12	503100060	Di, Si 5.2V 0.5W ±5%	WZ052	
CR13~24	503100020	Di, Si VR=30V IF=100mA	1S953	
CR25	503100006	Di, Si 12V 0.5W ±5%	WZ120	
CR26, 27	503100020	Di, Si VR=30V IF=100mA	1S953	
CR28	503100060	Di, Si 5.2V 0.5W ±5%	WZ052	
CR29	503100020	Di, Si VR=30V IF=100mA	1S953	
LED1, 2	503100080	Di, LED Red IF=25mA	TLR102A	
R1	501810422	R, Metal Film 22K 1/4W ±1%	RN1/4-22KF	
R2	501810412	R, " 12K " ±1%	RN1/4-12KF	
R3	501810422	R, " 22K " ±1%	RN1/4-22KF	
R4	501810412	R, " 12K " ±1%	RN1/4-12KF	
R5	501810310	R, " 1K " ±1%	RN1/4-1KF	
R6	501810315	R, " 1.5K " ±1%	RN1/4-1.5KF	
R7	501810510	R, " 100K " ±1%	RN1/4-100KF	
R8	501810218	R, " 180 " ±1%	RN1/4-180F	
R9	501810510	R, " 100K " ±1%	RN1/4-100KF	
R10	501810422	R, " 22K " ±1%	RN1/4-22KF	
R11	501810510	R, " 100K " ±1%	RN1/4-100KF	

Figure	Part No.	Description				Type	Remarks
R12	501810422	R, Metal Film	22K	1/4W	±1%	RN1/4-22KF	
R13	501810339	R, "	3.9K	"	±1%	RN1/4-3.9KF	
R14	501810322	R, "	2.2K	"	±1%	RN1/4-2,2KF	
R15	501810410	R, "	10K	"	±1%	RN1/4-10KF	
R16	501810322	R, "	2.2K	"	±1%	RN1/4-2.2KF	
R17	501810210	R, "	100	"	±1%	RN1/4-100F	
R18	501810510	R, "	100K	"	±1%	RN1/4-100KF	
R19~22	501810410	R, "	10K	"	±1%	RN1/4-10KF	
R23	501810175	R, "	75	"	±1%	RN1/4-75F	
R24	501810410	R, "	10K	"	±1%	RN1/4-10KF	
R25	501810482	R, "	82K	"	±1%	RN1/4-82K	
R26	501810610	R, "	1M	"	±1%	RN1/4-1MF	
R27	501810412	R, "	12K	"	±1%	RN1/4-12KF	
R28	501810324	R, "	2.4K	"	±1%	RN1/4-2.4KF	
R29	501810415	R, "	15K	"	±1%	RN1/4-15KF	
R30	501810410	R, "	10K	"	±1%	RN1/4-10KF	
R31, 32	501810327	R, "	2.7K	"	±1%	RN1/4-2.7KF	
R33	501810333	R, "	3.3K	"	±1%	RN1/4-3.3KF	
R34	501810410	R, "	10K	"	±1%	RN1/4-10KF	
R35	501810410	R, "	10K	"	±1%	RN1/4-10KF	
R36	501810333	R, "	3.3K	"	±1%	RN1/4-3.3KF	
R37, 38	501810327	R, "	2.7K	"	±1%	RN1/4-2.7KF	
R39	501810410	R, "	10K	"	±1%	RN1/4-10KF	
R40	501810351	R, "	5.1K	"	±1%	RN1/4-5.1KF	
R41	501810422	R, "	22K	"	±1%	RN1/4-22KF	
R42	501810347	R, "	4.7K	"	±1%	RN1/4-4.7KF	
R43	501810422	R, "	22K	"	±1%	RN1/4-22KF	
R44	501810410	R, "	10K	"	±1%	RN1/4-10KF	
R45	501810510	R, "	100K	"	±1%	RN1/4-100KF	
R46	501810410	R, "	10K	"	±1%	RN1/4-10KF	
R47	501810310	R, "	1K	"	±1%	RN1/4-1KF	
R48	501810215	R, "	150	"	±1%	RN1/4-150F	
R49	501810510	R, "	100K	"	±1%	RN1/4-100KF	
R50	501810436	R, "	36K	"	±1%	RN1/4-36KF	
R51	501810447	R, "	47K	"	±1%	RN1/4-47KF	
R52	501810533	R, "	330K	"	±1%	RN1/4-330KF	
R53	501810410	R, "	10K	"	±1%	RN1/4-10KF	
R54	501810533	R, "	330K	"	±1%	RN1/4-330KF	
R55	501810310	R, "	1K	"	±1%	RN1/4-1KF	
R56	501810410	R, "	10K	"	±1%	RN1/4-10KF	
R57	501810322	R, "	2.2K	"	±1%	RN1/4-2.2KF	
R58	501810410	R, "	10K	"	±1%	RN1/4-10KF	
R59	501810520	R, "	200K	"	±1%	RN1/4-200KF	
R60	501810456	R, "	56K	"	±1%	RN1/4-56K	
R61	501810410	R, "	10K	"	±1%	RN1/4-10KF	

Figure	Part No.	Description				Type	Remarks
R62	501810422	R, Metal Film	22K	1/4W	±1%	RN1/4-22KF	
R63	501810410	R, "	10K	"	±1%	RN1/4-10KF	
R64	501810456	R, "	56K	"	±1%	RN1/4-56KF	
R65	501810310	R, "	1K	"	±1%	RN1/4-1KF	
R66, 67	501810703	R, "	220	1/2W	±5%	RSF1/2B-220J	
R68	501810322	R, "	2.2K	1/4W	±1%	RN1/4-2.2KF	
R69	501810310	R, "	1K	"	±1%	RN1/4-1KF	
R70	501609728	R, Wirewound	10	5W	±5%	CS5P-10J	For 2CH, 4CH
R70	50160729	R, Wirewound	8.2	"	±5%	CS5P-8.2J	For 6CH
R70	50160730	R, "	6.8	"	±5%	CS5P-6.8J	For 8CH
R70	50160731	R, "	5.6	"	±5%	CS5P-5.6J	For 12CH
R71	501210227	R, Metal Film	270	1/4W	±1%	RN1/4-270F	
R100,101	501810339	R, "	3.9K	"	±1%	RN1/4-3.9F	
R102,103	501810375	R, "	7.5K	"	±1%	RN1/4-7.5KF	
RA1	501003334	Resistor Array				EXB-P8-8-103J	
RA2	501003332	Resistor Array				EXB-P8-8-222J	
RA3, 4	501002811	Resistor Array				EXBF9E-223J	
VR1	505103026	R, Trimmer, Cermet	10K			GF6P-10K	
C1~6	502403007	C, Ceramic	0.01μ	50WV		ULD06-103-L2A	
C7	502203013	C, Tantalum	1μ	33WV		CS15E1V010M	
C8	502102064	C, Electrolytic	47μ	10WV		ECEA1AS470	
C9	502203003	C, Tantalum	3.3μ	16WV		CS15E1C3R3M	
C10	502403028	C, Ceramic	2200P	50WV		UFD04SA222J-L2A	
C11, 12	502303002	C, Mylar Film	0.001μ	50WV		MFL-05D1	
C13, 14	502703021	C, Mica	33P	100WV		Z05-100V33P	
C15	502102064	C, Electrolytic	47μ	10WV		ELEA1AS470	
C16, 17	502102029	C, "	47μ	16WV		ECEA1CS470	
C18	502403007	C, Ceramic	0.01μ	50WV		ULD06-103-L2A	
C19	502303019	C, Mylar Film	0.0015μ	50WV		MFL-05D15	
C20, 21	502403007	C, Ceramic	0.01μ	50WV		ULD06-103-L2A	
C22	502203014	C, Tantalum	15μ	16WV		CS15E1C150M	
C23	502203002	C, Tantalum	10μ	16WV		CS15E1C100M	
C24	502303001	C, Mylar Film	0.0022μ	50WV		MFL-05D22	
C25	502303019	C, "	0.0015μ	50WV		MFL-05D15	
C26	502303004	C, "	0.01μ	50WV		MFL-05S1	
C27	502303005	C, "	0.047μ	50WV		MFL-05S47	
TP1~3	513400027	Check Pin				LC-1-G	
BZ	519300001	Beeper				SD161201	
X1	519105001	Crystal Oscillator	400kHz			HC-6/UW-400kHz	

Chart Controller (3300-40)

(4/4)

Figure	Part No.	Description	Type	Remarks
S1	508201010	Switch, Push, Non-Lock	2UOA	'85, 05~
S2, 3	508201018	Switch, Push, Lock	2UEE	"
S4~10	508202012	Switch, Push, Lock	7FS-14U-R7690	"
S11	508201010	Switch, Push, Non-Lock	2UOA	"
P1	513400045	Connector Pin Header 5P	HNC2-2.5P5DSL	
P2	513301010	" 30P	PS30PED4T1PN1	
FCA	52011060	Flat Cable with Connector 20PIN 42mm	L42-30P	
P1001	513200101	Connector Plug 1P	1625-1P-1	
PIN	513400001	Connector Pin	1854TL	
P.C.B.	511310310	Printed Circuit Board	3300-40	
	516100020	Cap, Black	B911	x10
	516100025	Cap, Ivory	B201	
	508201007	Spacer	1P-10	x11

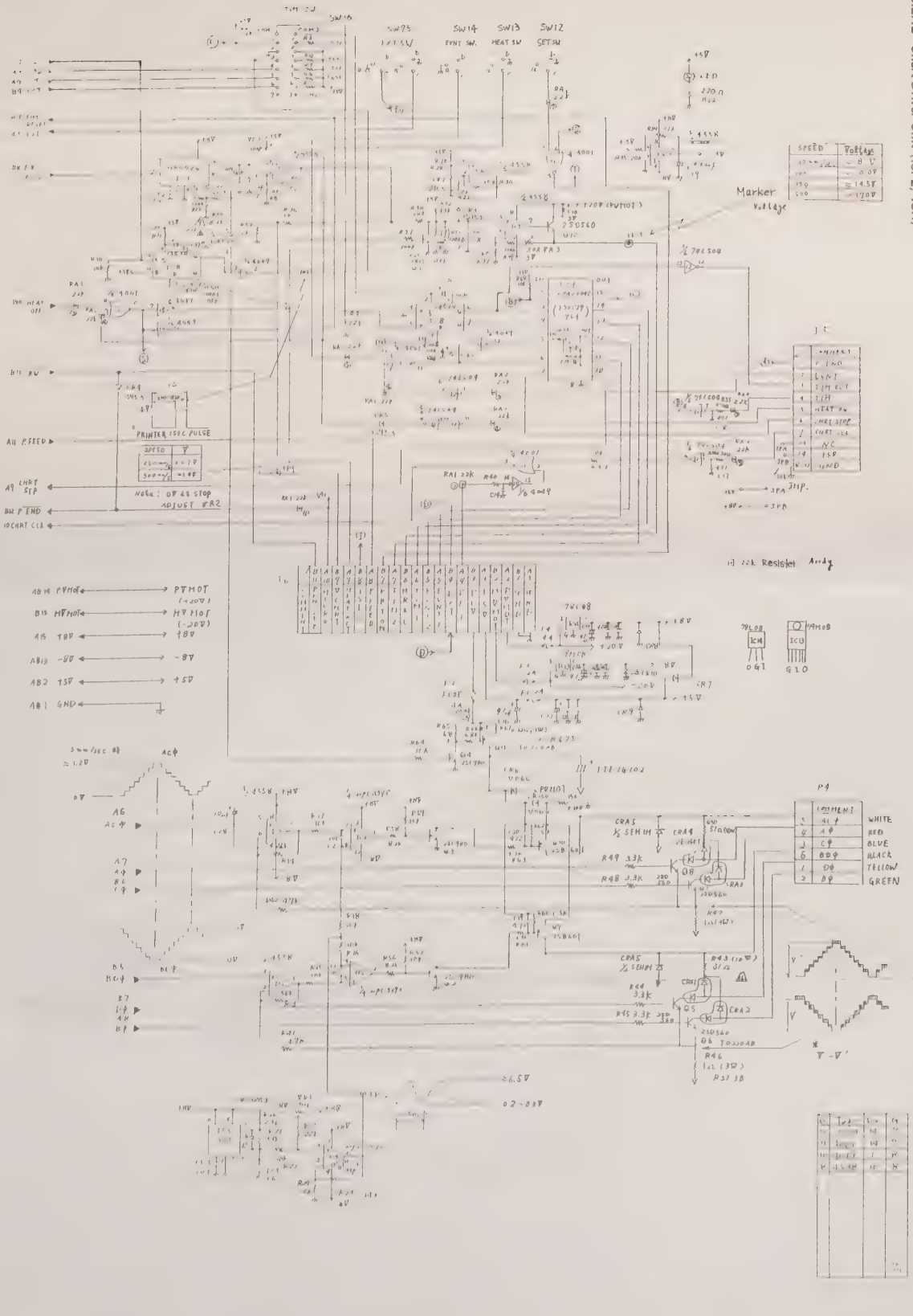

SW15 1ST SW
SW14 EVNT SW.
SW13 HEAT SW
SW12 SETSW
Marker Voltage
SPEED
Voltage
PRINTER 1SEC PULSE
SPEED
NOTE: OF 4S STOP
ADJUST VR2
RA1 22k Resister Array
PTMOT (+20V)
HTMOT (-20V)
+18V
-8V
+5V
GND
WHITE
RED
BLUE
BLACK
YELLOW
GREEN
02~03V

Chart Driver (2, 4CH)

Figure	Part No.	Description	Type	Remarks
IC1	503300054	IC, Op-Amp	μPC4558C	
IC2	503300121	IC, Compactor	μPC339C	
IC3	503302122	IC, F/V Converter	MB4206	
IC4	503300123	IC, Op-Amp	μPC157C	
IC5	503300030	IC, Timer	NE555	
IC6, 7	503300054	IC, Op-Amp	μPC4558C	
IC8	503301035	IC, CMOS Mono-Multi	HD14538B	
IC9	503300098	IC, Transistor Array	μPA2004C	
IC10	503300094	IC, CMOS Inverting Buffer	TC4049BP	
IC11	503300124	IC, CMOS 2 Input-NOR	TC4001BP	
IC12	503300125	IC, TTL Inverter	SN74LS04	
IC13	503301050	IC, Voltage Regulator −8V	μPC79M08	
IC14	503301169	IC, Voltage Regulator +8V	μPC78L08	
Q1	503203014	T, NPN 50V 150mA 400mW	2SC1815, Y	
Q2~4	503203017	T, NPN 50V 100mA 400mW	2SC980, O	
Q5~8	503200028	T, NPN 100V 5A 1.5W	2SD560-K	
Q9, 10	503203018	T, NPN −100V −5A 1.5W	2SB601, L	
Q11	503203020	T, NPN −60V −7A 3W	2SB675, OL	
Q12	503200028	T, NPN 100V 5A 1.5W	2SD560-K	
LED1	512100018	Di, LED RED IF=30mA	SLB26UR	
CR1~5	503100020	Di, Si VR=30V IF=100mA	1S953	
CR6	503103004	Di, Si VR=200V IF=2A	U06C C	
R7~10	503100021	" VR=200V IF=1.1A	V06C	
CRA~4	503100063	Di, Si Diode Module	2E4DM	
CRA5	503100066	" "	5EH2M	
CR100	503103004	Di, Si VR=200V IF=2A	U06C	
R1	501810610	R, Metal Film 1M 1/4W ±1%	RN1/4-1MF	
R2	501810322	R, " 2.2K " "	RN1/4-2.2KF	
R3	501810510	R, " 100K " "	RN1/4-100KF	
R4	501810433	R, " 33K " "	RN1/4-33KF	
R5	501810510	R, " 100K " "	RN1/4-100KF	
R6	501810556	R, " 560K " "	RN1/4-560KF	
R7	501810318	R, " 1.8K " "	RN1/4-1.8KF	
R8	501810410	R, " 10K " "	RN1/4-10KF	
R9	501810422	R, " 22K " "	RN1/4-22KF	
R10	501810410	R, " 10K " "	RN1/4-10KF	
R11	501810610	R, " 1M " "	RN1/4-1MF	
R12	501810222	R, " 220 " "	RN1/4-220F	
R13, 14	501810456	R, " 56K " "	RN1/4-56KF	
R15~18	501810410	R, " 10K " "	RN1/4-10KF	
R19	501810456	R, " 56K " "	RN1/4-56KF	
R20	501810382	R, " 8.2K " "	RN1/4-8.2KF	
R21	501810562	R, " 620K 1/4W ±1%	RN1/4-620KF	
R22	501810512	R, " 120K " "	RN1/4-120KF	

Chart Driver (2, 4CH)

Figure	Part No.	Description				Type	Remarks
R23	501810424	R, Metal Film	24K	1/4W	±1%	RN1/4-24KF	
R24	501810410	R, "	10K	"	"	RN1/4-10KF	
R25	501810422	R, "	22K	"	"	RN1/4-22KF	
R26	501810324	R, "	2.4K	"	"	RN1/4-2.4KF	
R27	501810410	R, "	10K	"	"	RN1/4-10KF	
R28	501810347	R, "	4.7K	"	"	RN1/4-4.7KF	
R29	501810333	R, "	3.3K	"	"	RN1/4-3.3KF	
R30	501810415	R, "	15K	"	"	RN1/4-15KF	
R31	501810410	R, "	10K	"	"	RN1/4-10KF	
R32	501810456	R, "	56K	"	"	RN1/4-56KF	
R33	501810520	R, "	200K	"	"	RN1/4-200KF	
R34	501810412	R, "	12K	"	"	RN1/4-12KF	
R35	501810420	R, "	20K	"	"	RN1/4-20KF	
R36	501810310	R, "	1K	"	"	RN1/4-1KF	
R37	501810418	R, "	18K	"	"	RN1/4-18KF	
R38	501810415	R, "	15K	"	"	RN1/4-15KF	
R39	501810512	R, "	120K	"	"	RN1/4-120KF	
R40~42	501810347	R, "	4.7K	"	"	RN1/4-4.7KF	
R43	501609750	R, "	51	10W	±5%	MU10P-51J	
R44, 45	501810333	R, "	3.3K	1/4W	±1%	RN1/4-3.3KF	
R46, 47	501609723	R, "	1	3W	±5%	RSF3B-1J	
R48, 49	501810333	R, "	3.3K	1/4W	±1%	RN1/4-3.3KF	
R50	501609750	R, "	51	10W	±5%	MU10P-51J	
R51	501810510	R, "	100K	1/4W	±1%	RN1/4-100KF	
R52	501810310	R, "	1K	"	"	RN1/4-1KF	
R53	501810410	R, "	10K	"	"	RN1/4-10KF	
R54, 55	501810247	R, "	470	"	"	RN1/4-470F	
R56	501810382	R, "	8.2K	"	"	RN1/4-8.2KF	
R57	501810410	R, "	10K	"	"	RN1/4-10KF	
R58	501810382	R, "	8.2K	"	"	RN1/4-8.2KF	
R59	501810410	R, "	10K	"	"	RN1/4-10KF	
R60	501810315	R, "	1.5K	"	"	RN1/4-1.5KF	
R61	501810333	R, "	3.3K	"	"	RN1/4-3.3KF	
R62	501810315	R, "	1.5K	"	"	RN1/4-1.5KF	
R63	501810333	R, "	3.3K	"	"	RN1/4-3.3KF	
R64	501810410	R, "	10K	"	"	RN1/4-10KF	
R65, 66	501810368	R, "	6.8K	"	"	RN1/4-6.8KF	
R67	501605710	R, "	0.22	1W	±5%	RSF1B-0.22J	
R68~70	501810410	R, "	10K	1/4W	±1%	RN1/4-10KF	
R100	501810415	R, "	15K	"	"	RN1/4-15KF	
VR1	504207047	R, Trimmer, Cermet	20K			TM10KPV-20K	
VR2	505103029	R, Trimmer, Cermet	500K			GF6P-500K	
VR3	504207038	R, Trimmer, Cermet	50K			TM10KPV-50K	

Chart Driver (2, 4CH)

Figure	Part No.	Description	Type	Remarks
RT1	503103012	Thermistor B-Class 100K	100KD-7	
C1, 2	502403029	C, Ceramic 100pF 50WV	RAU04SA101J-L05A	
C3	502403024	C, Ceramic 33pF 50WV	RAU04SL330KL05AE	
C4	502303019	C, Mylar Film 1500pF 50WV	MFL-05D15	
C5, 6	502303004	C, Mylar Film 0.01μF 50WV	MFL-05S1	
C7	502203024	C, Tantalum 1.5μF 16WV	CS15EIC1R5M	
C8	502403029	C, Ceramic 100pF 50WV	RAU04SA101J-L05A	
C9	502103128	C, Electrolytic 10μF 25WV	ECEA1EU-100	
C10	502901007	C, Electrolytic 10μF 25WV	ECEA1ES100	
C11	502203002	C, Tantalum 10μF 16WV	CS15E1C100M	
C12	502203015	C, " 0.47μF 35WV	CS15E1VR47M	
C13	502403007	C, Ceramic 0.01μF 50WV	ROU06F103Z-L45A	
C14	502403035	C, Ceramic 220pF 50WV	RAU04SA221J-L05A	
C15	502403007	C, Ceramic 0.01μF 50WV	ROU06F103Z-L45A	
C16	502103089	C, Electrolytic 47μF 10WV	ECEA1AU-470	
C17, 18	502403035	C, Ceramic 220pF 50WV	RAU04SA221J-L05A	
C19, 20	502403007	C, Mylar Film 0.0047μ 50WV	MFL-05D47	
C21	502103114	C, Ceramic 0.01μF 50WV	ROU06F103Z-L45A	
C22	502103114	C, Electrolytic 47μF 16WV	ECEA1CU-470	
C23~25	502403007	C, Ceramic 0.01μF 50WV	ROU06F103Z-L45A	
C26	502103114	C, Electrolytic 47μF 16WV	ECEA1CU-470	
C27, 28	502103128	C, " 10μF 25WV	ECEA1EU-100	
C29	502103145	C, " 10μF 35WV	ECEA1VU100	
C30	502203001	C, Tantalum 10μF 16WV	CS15EIC100M	
RA1	501002831	Resistor Array 22K ±5%	EXBF9E-223J	
RA2	501002814	" " "	EXBF5E-223J	
FTE	502403037	C, Electrolytic 1000μF 500WV	FTE1G102	
SW12	508201010	Switch, Push, Non-Lock	2UOA	
SW13	508201018	Switch, Push, Lock	2UEE	
SW14	508201010	Switch, Push, Non-Lock	2UOA	
SW16	508101015	Switch, Rotary	DSR2-6	
SW75	508201018	Switch, Push, Lock	2UEE	
F1	512300010	Fuse 2A	MC-2	
F2	512300025	" 4A	MC-4	
F3	512300010	" 2A	MC-2	
F4	512300025	" 4A	MC-4	
TP1,2,3	513400027	Check Pin	LC-1-G	
P3	513301010	Connector 30pin	PS30PED4T1PN1	
P4	513400046	" 5pin	HNC2-2 5P-6DSL02	

Chart Driver (2, 4CH)

Figure	Part No.	Description	Type	Remarks
J5	513300344	Connector 10pin	57-40140-D39	
J6	513300604	" 10Px2	225J21021-487	
PCB	511330020	Printed Circuit Board	3300-13	

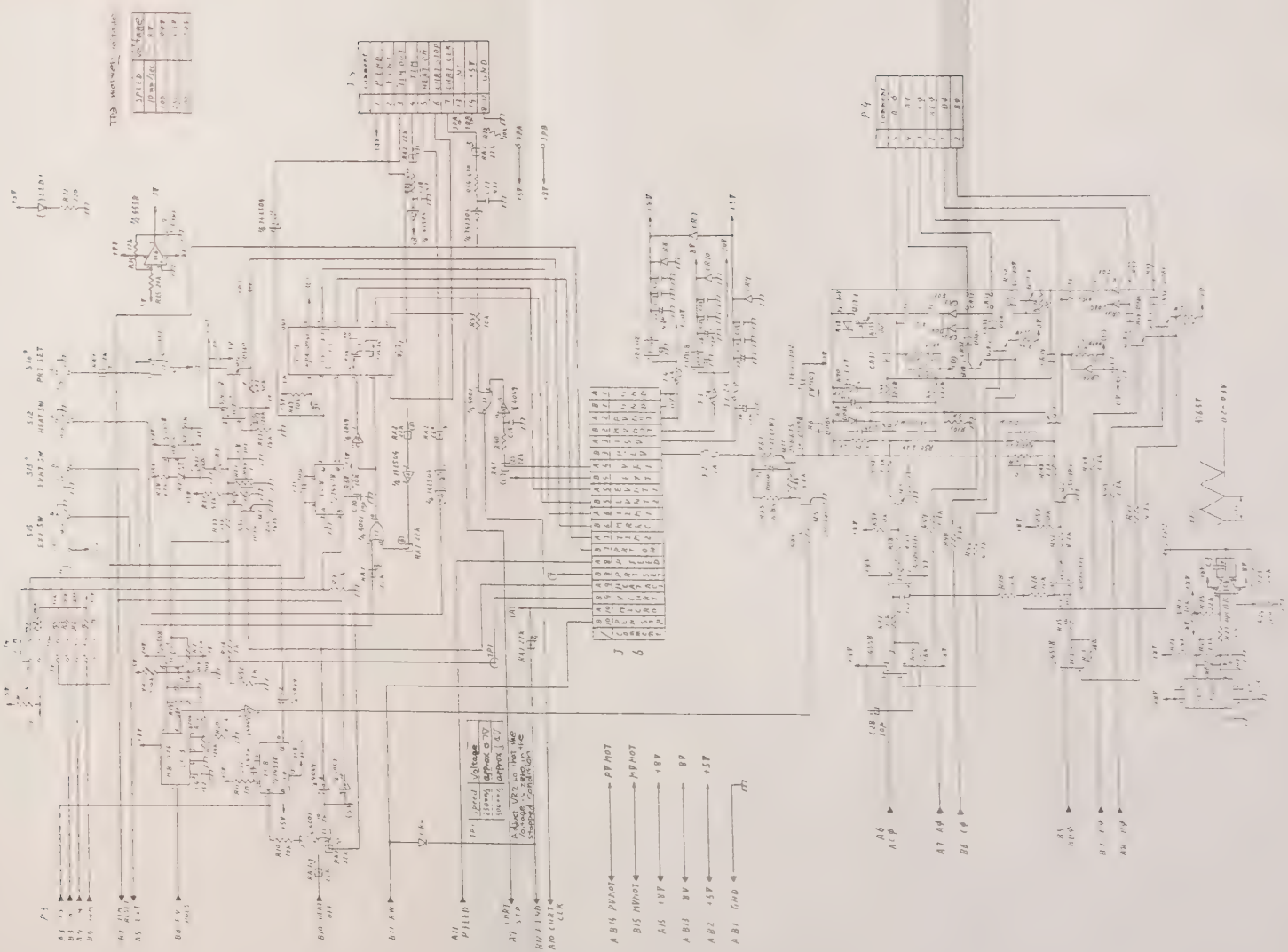


Chart Driver (6, 8, 12CH)

Figure	Part No.	Description	Type	Remarks
IC1	503300054	IC, Dual Op-Amp	μPC4558C	
IC2	503300121	IC, Comparator	μPC339C	
IC3	503300122	IC, F/V Converter	MB4206	
IC4	503300123	IC, Op-Amp	μPC157C	
IC5	503300030	IC, Timer	NE555	
IC6, 7	503300054	IC, Dual Op-Amp	μPC4558C	
IC8	503301035	IC, CMOS Mono-Multi	HD14538B	
IC9	503300098	IC, Transistor Array	μPA2004C	
IC10	503300094	IC, CMOS Inverting Buffer	TC4049BP	
IC11	503300124	IC, CMOS 2 Input NOR	TC4001BP	
IC12	503300125	IC, TTL Inverter	SN74LS04	
IC13	503301050	IC, Voltage Regulator −8V	μPC79M08	
IC14	503301169	IC, " +8V	μPC78L08	
Q1	503203014	T, NPN 50V 150mA 400mW	2SC1815, Y	
Q2~4	503203017	T, NPN 50V 100mA 400mW	2SC980, O	
Q11	503203020	T, PNP −60V −7A 3W	2SB675, OL	
Q12	503200028	T, NPN 100V 5A 1.5W	2SD560-K	
Q17	503203063	T, Array (PNP Darlington x 4)	FT5761M	
Q18	503203065	T, Array (NPN Darlington x 4)	FT5758M	
CR1~5	503100020	Di, Si VR=30V IF=100mA	1S953	
CR6	503103004	Di, Si VR=200V IF=2A	U06C	
CR7~10	503100021	Di, Si VR=200V IF=1.1A	V06C	
CR18	503103004	Di, Si VR=200V IF=2A	U06C	
CR33~36	503103004	Di, Si " "	U06C	
CR37	503100020	Di, Si VR=30V IF=100mA	1S953	
CR38	503100037	Di, Zener 30V	RD30FB3	
CR39	503100020	Di, Si VR=30V IF=100mA	1S953	
CR40	503100037	Di, Zener 30V	RD30FB3	
CR52	503103004	Di, Si VR=200V IF=2A	U06C	
CR54	503103004	Di, Si " "	"	
CR56	503103004	Di, Si " "	"	
CR58	503103004	Di, Si " "	"	
CR59	503100066	Di, Si Diode Module	5EH2M	
CR90	503100052	Di, Zener 3.2V 500mW	RD3.3EB2	
R1	501810610	R, Metal Film 1M 1/4W ±1%	RN1/4-1MF	
R2	501810322	R, " 2.2K " "	RN1/4-2.2KF	
R3	501810510	R, " 100K " "	RN1/4-100KF	
R4	501810433	R, " 33K " "	RN1/4-33KF	
R5	501810510	R, " 100K " "	RN1/4-100KF	
R6	501810556	R, " 560K " "	RN1/4-560KF	
R7	501810318	R, " 1.8K " "	RN1/4-1.8KF	
R8	501810410	R, " 10K " "	RN1/4-10KF	

Chart Driver (6, 8, 12CH)

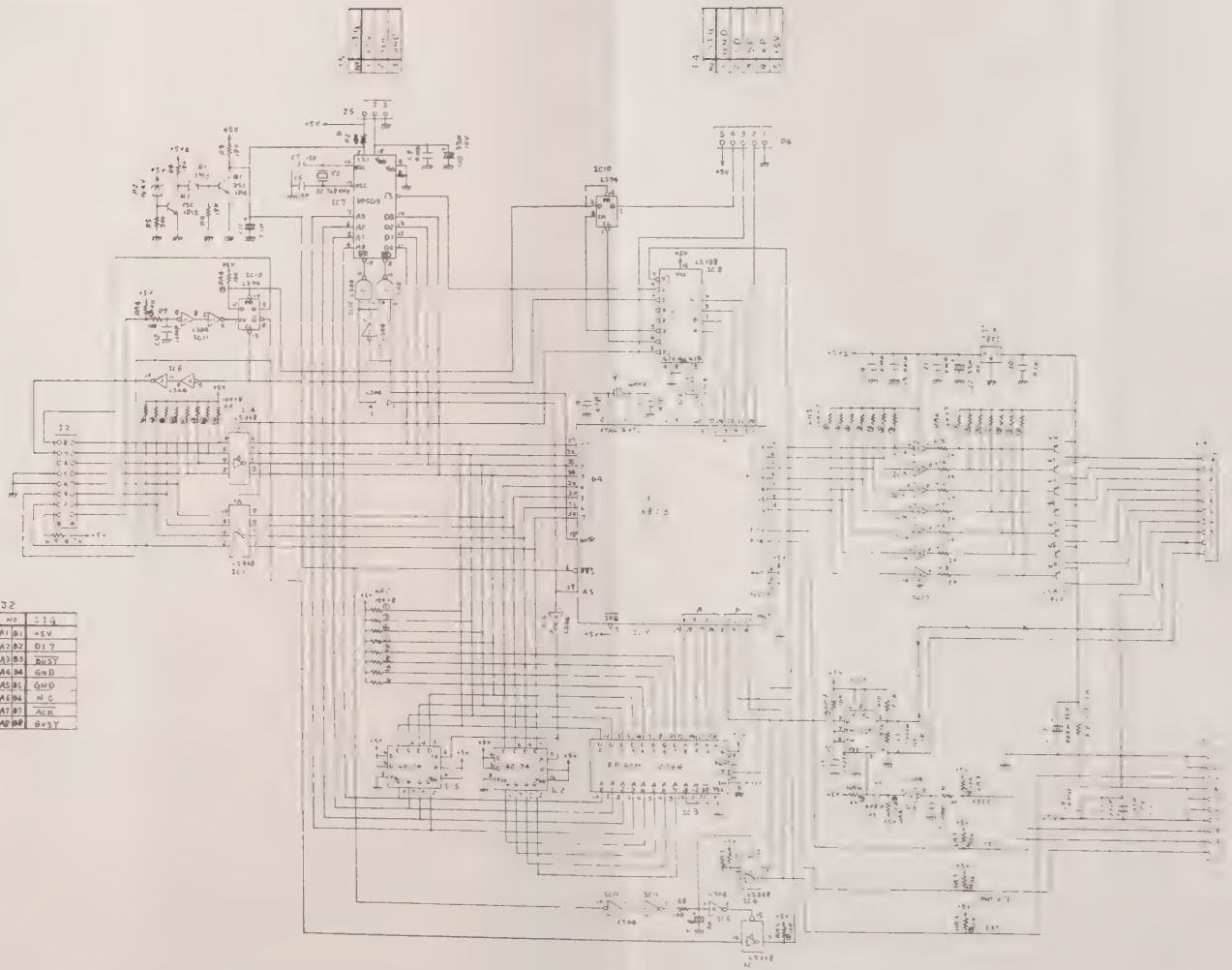
Figure	Part No.	Description				Type	Remarks
R9	501810422	R, Metal Film	22K	1/4W	±1%	RN1/4-22KF	
R10	501810410	R, "	10K	"	"	RN1/4-10KF	
R11	501810610	R, "	1M	"	"	RN1/4-1MF	
R12	501810222	R, "	220	"	"	RN1/4-220F	
R13, 14	501810456	R, "	56K	"	"	RN1/4-56KF	
R15~18	501810410	R, "	10K	"	"	RN1/4-10KF	
R19	501810456	R, "	56K	"	"	RN1/4-56KF	
R20	501810382	R, "	8.2K	"	"	RN1/4-8.2KF	
R21	501810562	R, "	620K	"	"	RN1/4-620KF	
R22	501810512	R, "	120K	"	"	RN1/4-120KF	
R23	501810424	R, "	24K	"	"	RN1/4-24KF	
R24	501810410	R, "	10K	"	"	RN1/4-10KF	
R25	501810422	R, "	22K	"	"	RN1/4-22KF	
R26	501810324	R, "	2.4K	"	"	RN1/4-2.4KF	
R27	501810410	R, "	10K	"	"	RN1/4-10KF	
R28	501810347	R, "	4.7K	"	"	RN1/4-4.7KF	
R29	501810333	R, "	3.3K	"	"	RN1/4-3.3KF	
R30	501810415	R, "	15K	"	"	RN1/4-15KF	
R31	501810410	R, "	10K	"	"	RN1/4-10KF	
R32	501810456	R, "	56K	"	"	RN1/4-56KF	
R33	501810520	R, "	200K	"	"	RN1/4-200KF	
R34	501810412	R, "	12K	"	"	RN1/4-12KF	
R35	501810420	R, "	20K	"	"	RN1/4-20KF	
R36	501810310	R, "	1K	"	"	RN1/4-1KF	
R37	501810418	R, "	18K	"	"	RN1/4-18KF	
R38	501810415	R, "	15K	"	"	RN1/4-15KF	
R39	501810512	R, "	120K	"	"	RN1/4-120KF	
R40~42	501810347	R, "	4.7K	"	"	RN1/4-4.7KF	
R44, 45	501810333	R, "	3.3K	"	"	RN1/4-3.3KF	
R46, 47	501605738	R, "	1.5K	1W	±5%	RSF1B-1.5KJ	
R48, 49	501810333	R, "	3.3K	1/4W	±1%	RN1/4-3.3KF	
R50	501810322	R, "	2.2K	"	"	RN1/4-2.2KF	
R51	501810510	R, "	100K	"	"	RN1/4-100KF	
R52	501810310	R, "	1K	"	"	RN1/4-1KF	
R53	501810410	R, "	10K	"	"	RN1/4-10KF	
R54, 55	501810247	R, "	470	"	"	RN1/4-470F	
R56	501810382	R, "	8.2K	"	"	RN1/4-8.2KF	
R57	501810410	R, "	10K	"	"	RN1/4-10KF	
R58	501810382	R, "	8.2K	"	"	RN1/4-8.2KF	
R59	501810410	R, "	10K	"	"	RN1/4-10KF	
R64	501810410	R, "	10K	"	"	RN1/4-10KF	
R65, 66	501810368	R, "	6.8K	"	"	RN1/4-6.8KF	
R67	501605710	R, "	0.22	1W	±5%	RSF1B-0.22J	
R68~70	501810410	R, "	10K	1/4W	±1%	RN1/4-10KF	
R105	501810415	R, "	15K	"	"	RN1/4-15KF	

Chart Driver (6, 8, 12CH)

Figure	Part No.	Description			Type	Remarks
R106	501810210	R, Metal Film	100	1/4W ±1%	RN1/4-100F	
R120	501810322	R, "	2.2K	" "	RN1/4-2.2KF	
R148,149	501810333	R, "	3.3K	" "	RN1/4-3.3KF	
R151,152	501810151	R, "	51	" "	RN1/4-51F	
R153,154	501609723	R, "	1	3W ±5%	RSF3B-1J	
R155	501810210	R, "	100	" "	RN1/4-100F	
C1, 2	502403029	C, Ceramic	100pF	50WV	RAU04SA101J-L05A	
C3	502403034	C, "	33pF	"	RAU04SL330K-L05AE	
C4	502303019	C, Mylar Film	0.0015μF	"	MFL-05D15	
C5, 6	502303004	C, "	0.01μF	"	MFL-05S1	
C7	502203024	C, Tantalum	1.5μF	16WV	CS15E1C1R5M	
C8	502403029	C, Ceramic	100pF	50WV	RAU04SA101J-L05A	
C9	502103128	C, Electrolytic	10μF	25WV	ECEA1EU-100	
C10	502901007	C, "	10μF	25WV	ECEA1ES-100M	
C11	502203002	C, Tantalum	10μF	16WV	CS15E1C100M	
C12	502203015	C, "	0.47μF	35WV	CS15E1VR47M	
C13	502403007	C, Ceramic	0.01μF	50WV	ROU06F103Z-L45AC	
C14	502403035	C, Ceramic	220pF	"	RAU05SA221J-L05A	
C15	502403007	C, Ceramic	0.01μF	"	ROU06F103Z-L45AC	
C16	502103089	C, Electrolytic	47μF	10WV	ECEA1AU470	
C17, 18	502403035	C, Ceramic	220pF	50WV	RAU05SA221J-L05AC	
C21	502403007	C, "	0.01μF	"	ROU06F103Z-L45AC	
C22	502103114	C, Electrolytic	47μF	16WV	ECEA1CU-470	
C23~25	502403007	C, Ceramic	0.01μF	50WV	ROU06F103Z-L45AC	
C26	502103114	C, Electrolytic	47μF	16WV	ECEA1CU-470	
C27, 28	502103128	C, "	10μF	25WV	ECEA1EU-100	
C29	502103145	C, "	10μF	35WV	ECEA1VU100	
C30	502203002	C, Tantalum	10μF	16WV	CS15E1C100M	
C62, 63	502403036	C, Ceramic	680pF	50WV	RAU08SA681J-L45AC	
C109	502102026	C, Electrolytic	47μF	35WV	ECEA1VS470	
C111	502303004	C, Mylar Film	0.01μF	50WV	MFL-05S1	
C128	502303004	C, Mylar Film	0.01μF	"	MFL-05S1	
FTE	502403037	C, Electrolytic	1000μF	"	FTE1G102	
VR1	504207047	R, Trimmer, Cermet	20K		TM10KPV-20K	
VR2	505103029	R, Trimmer, Cermet	500K		GF6P-500K	
VR3	504207038	R, Trimmer, Cermet	50K		TM10KPV-50K	
RA1	501002831	Resistor Array	22K	±5%	EXBF9E-223J	
RA2	501002814	"	"	"	EXBF5E-223J	
RT1	503103012	Thermistor B-Class	100K		100KD-7	

Chart Driver (6, 8, 12CH)

Figure	Part No.	Description	Type	Remarks
SW12	508201010	Switch, Push, Non-Lock	2UOA	
SW13	508201018	Switch, Push, Lock 2VEE		
SW14	508101010	Switch, Push, Non-Lock	2SR2-6	
SW15	508201018	Switch, Push, Lock	2VEE	
SW16	508201015	Switch, Push, Rotary	2SR2-6	
P3	513301010	Connector 30p	PS30PED4T1PN1	
P4	513400046	Connector 6p	HNC2-2.5P-6DSL02	
J5	513100344	Connector 14P	57-40140-D39	
J6	513300604	Connector 20P	225J21021-487	
LED1	512100018	Di, LED, Red IF=30mA	SLB26UR	
F1	512300010	Fuse 2A	MC-2	
F2	512300025	'' 4A	MC-4	
F3	512300010	'' 2A	MC-2	
F4	512300025	'' 4A	MC-4	
TP1~3	513400027	Check Pin	LC-1-G	
PCB	511311101	Printed Circuit Board	31013B	



J2		
SIG	NO	SIG
STB	A1 B1	+5V
DI 6	A2 B2	DI 7
DI 5	A3 B3	BUSY
DI 4	A4 B4	GND
DI 3	A5 B5	GND
DI 2	A6 B6	N C
DI 1	A7 B7	ACK
DI 0	A8 B8	BUSY

NO	IC	VCC	VSS
1	M74LS348	16	8
2	TC40174	16	8
3	MB2764	28	14
4	M74LS368	16	8
5	TC40174	16	8
6	M74LS04	14	7
7	RP5C15	18	9
8	M74LS138	16	8
9	MB8803	9	1
10	M74LS00	14	7
11	M74LS04	14	7
12	DM74LS00	14	7
13	HD7407	14	7
14	HD7407	14	7
15	PPC1555	8	
16	AN7805		

Printer Control Circuit

(1/2)

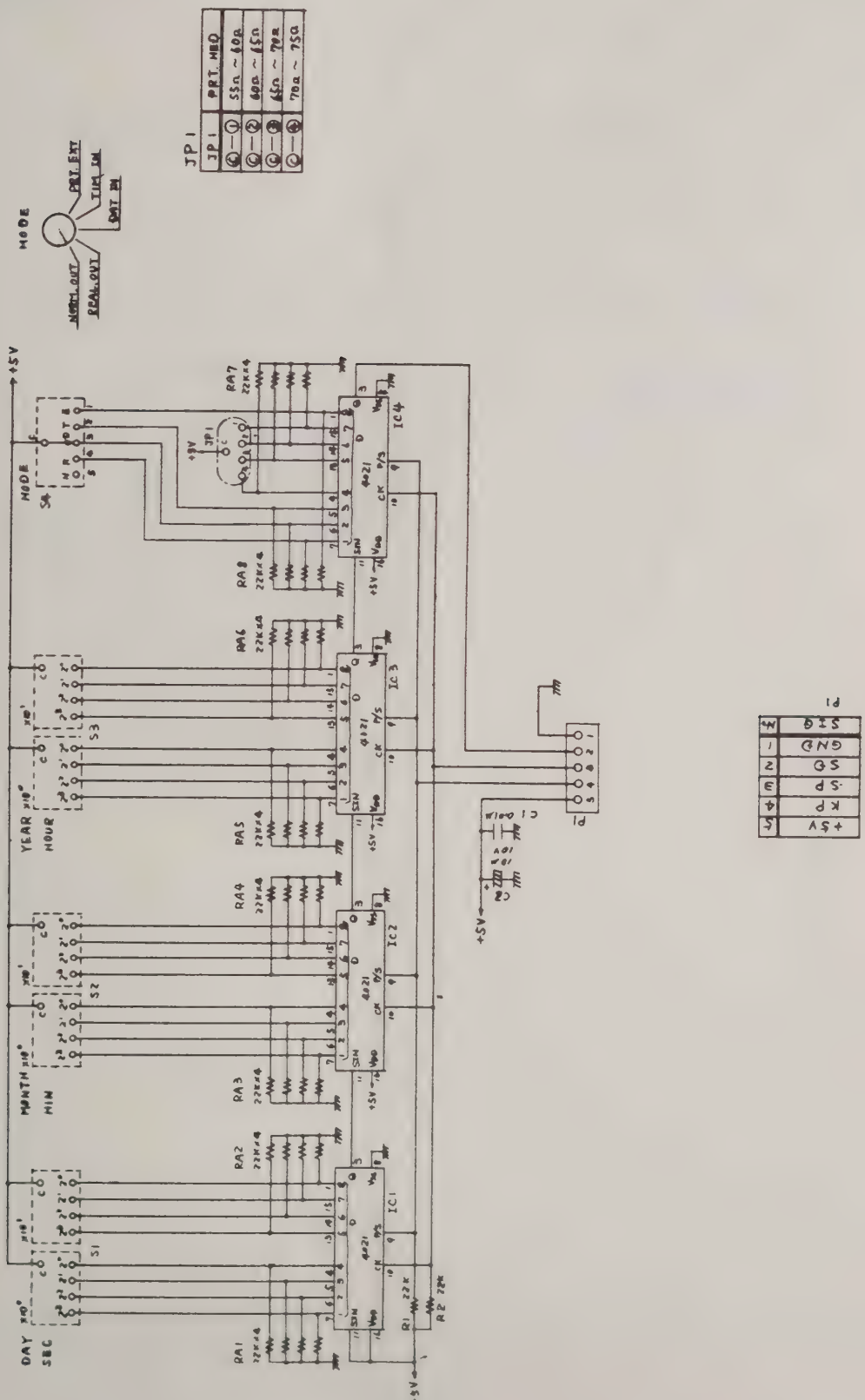
Figure	Part No.	Description	Type	Remarks
IC1	503303469	IC, TTL Hex Bus Drivers	M74LS368AP	
IC2	503300141	IC, CMOS Hex Type D Flip-Flop	TC40174BP	
IC3	503301052	IC, EPROM (64 K-Bytes)	MB2764-30	
IC4	503303469	IC, TTL Hex Bus Drivers	M74LS368AP	
IC5	503300141	IC, CMOS Hex Type D Flip-Flop	TC40174BP	
IC6	503303471	IC, TTL Hex Inverters	M74LSO4P	
IC7	503303824	IC, CMOS Real Time Clock	RP5C15	
IC8	503303472	IC, TTL 3 to 8 Decoder	M74LS138P	
IC9	503303435	IC, CPU	HD6803	
IC10	503303470	IC, TTL Dual Type D Flip Flop	M74LS74AP	
IC11	503303471	IC, TTL Hex Inverters	M74LSO4P	
IC12	503300138	IC, TTL Quad 2 Input NAND	DN74LSOO	
IC13,14	503303784	IC, TTL Hex Buffers O.C.	HD7407	
IC15	503303473	IC, Timer	μPC1555C	
IC16	503301059	IC, Voltage Regulator 5V 1A	AN7805F	
Q1, 2	503203014	T, NPN 50V 150mA 400mW	2SC1815, Y	
Q3~9	503203019	T, PNP −50V −2A 900mW	2SA1020, Y	
CR1	503100020	Di, Si VR=30V IF=100mW	1S953	
CR2	503100058	Di, Zener 4.2V 500mW ±5%	RD4.3EB3	
R1	501810210	R, Metal Film 100 1/4W ±1%	RN1/4-100F	
R3, 4	501810418	R, " 18K " "	RN1/4-18KF	
R5	501810230	R, " 300 " "	RN1/4-300F	
R6	501810418	R, " 18K " "	RN1/4-18KF	
R7, 8	501810210	R, " 100 " "	RN1/4-100F	
R9	501605711	R, " 1 1W ±5%	RSF1B-1J	
R10	501810391	R, " 9.1K 1/4W ±1%	RN1/4-9.1KF	
R11	501810447	R, " 47K " "	RN1/4-47KF	
R12~18	501810312	R, " 1.2K " "	RN1/4-1.2KF	
R19	501810347	R, " 4.7K " "	RN1/4-4.7KF	
RA1~6	501003331	Resistor Array 10Kx8 ±8%	EXBF9E-103J	
C1	502403007	C, Ceramic 0.01μF 50WV	ROU06F103Z-L45AC	
C2	502103034	C, Electrolytic 100μF 10WV	ECEA1AS101	
C3	502403015	C, Ceramic 1000pF 50WV	OU05B102K-L05AC	
C6, 7	502703007	C, Mica 15pF 100WV	Z05-100V15P	
C8	502203002	C, Tantalum 10μF 16WV	CS15E1C100M	
C9	502403007	C, Ceramic 0.01μF 50WV	ROU06F103Z-145AC	
C10	502103179	C, Electrolytic 33μF 10WV	ECEA1AK330	
C11	502203013	C, Tantalum 10μF 16WV	CS15E1V010M	
C12	502403015	C, Ceramic 1000pF 50WV	ROU05B102K-145AC	
C13, 14	502403007	C, " 0.01μF 50WV	ROU06F103Z-L45AC	

Printer Control Circuit

(2/2)

Figure	Part No.	Description	Type	Remarks
C15	502303008	C, Mylar Film 0.022μF 50WV	MFL-05S22	
C16	502303002	C, " 0.001μF 35WV	MFL-05D1	
C17	502103178	C, Electrolytic 1000μF 35WV	ECEB1VU102	
C18	502303002	C, Mylar Film 0.001μF 50WV	MFL-05D1	
C19	502403007	C, Ceramic 0.01μF 50WV	ROU06F103Z-L45AC	
C20	502403005	C, " 0.1μF 50WV	UAT10X104M-L45AC	
C21	502403007	C, " 0.01μF 50WV	ROU06F103Z-L45AC	
C22	502103179	C, Electrolytic 33μF 10WV	ECEA1AK330	
Y1,C4,5	519105006	Oscillator 4MHz	KBP-4.0M	
Y2	502901015	" 32.768kHz	KF38G	
P3	513400068	Connector, Pin Header 10P	HNC2-2.5P-10DSL	
P4	513400045	" 5P	HNC2-2.5P-5DSL	
	513400119	IC-Socket 28P	228-AG29D	For IC3
PCB	511350070	Printed Circuit Board	PR3500-07A	
J1	513400072	Connector Receptacle 10P	HNC2-2.5S-10	
J2	513400050	Connector Pin Header 16P	FCN365P016-AG	
J5	513400039	Connector Pin Header 3P	HNC2-2.5P-3DS	
(J5)	513400041	Connector Receptacle 3P	HCN2-2.5S-3	
f(J5)	513400037	Contact Pin for HNC2-2.5 Type	HNC2-2.5S-A	
For J2	513400053	Holder for FCN365P TYPE	FCN360A2	x2 (For J2)

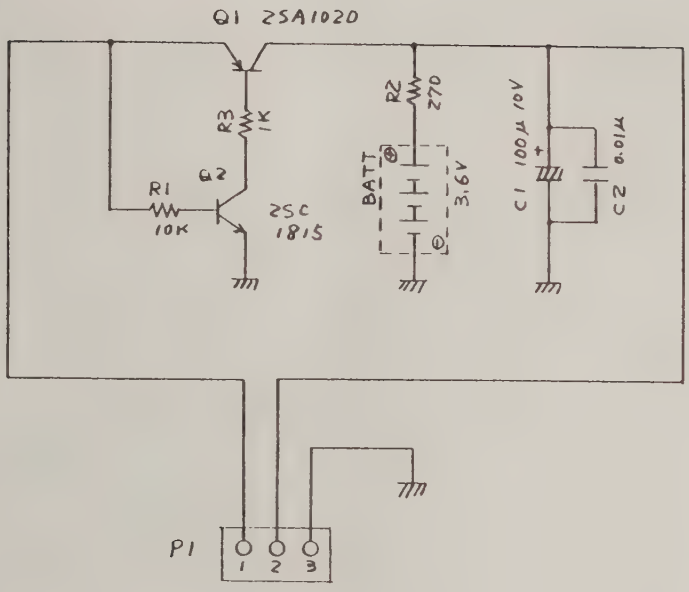
5.2.15 Printer Control Switch Unit



Printer Control Switch Unit

Figure	Part No.	Description	Type	Remarks
IC1~4	503300131	IC, CMOS 8 Bit Stage Shift Register	TC4021BP	
R1, 2	501810422	R, Metal Film 22K 1/4W ±1%	RN1/4-22KF	
RA1~8	501102745	Resistor Array 22K×4	RKC1/8B422KohmK	
C1	502403007	C, Ceramic 0.01μF 50WV	ROU06F103Z-L45AC	
C2	502303002	C, Tantalum 10μF 16WV	CS15E1C100M	
P1	513400044	Connector, Receptacle 5P	HNC2-2.5S-5	
	513400037	Contact Pin	HNC2-2.5S-A	For P1
S1~3	508401012	Switch, Thumbwheel, Decimal	A7MA-206-P2	
	508401013	Switch, Hook	A7M-2M	For S1~3
	508401015	Switch, Spacer	A7M-2PA	For S1~3
S4	507111113	Switch, Rotary 1-5	JRA1-12, Stopper	
PCB	511350090	Printed Circuit Board	PR3500-09	PR3500-09

5.2.16 Printer Control Backup Unit

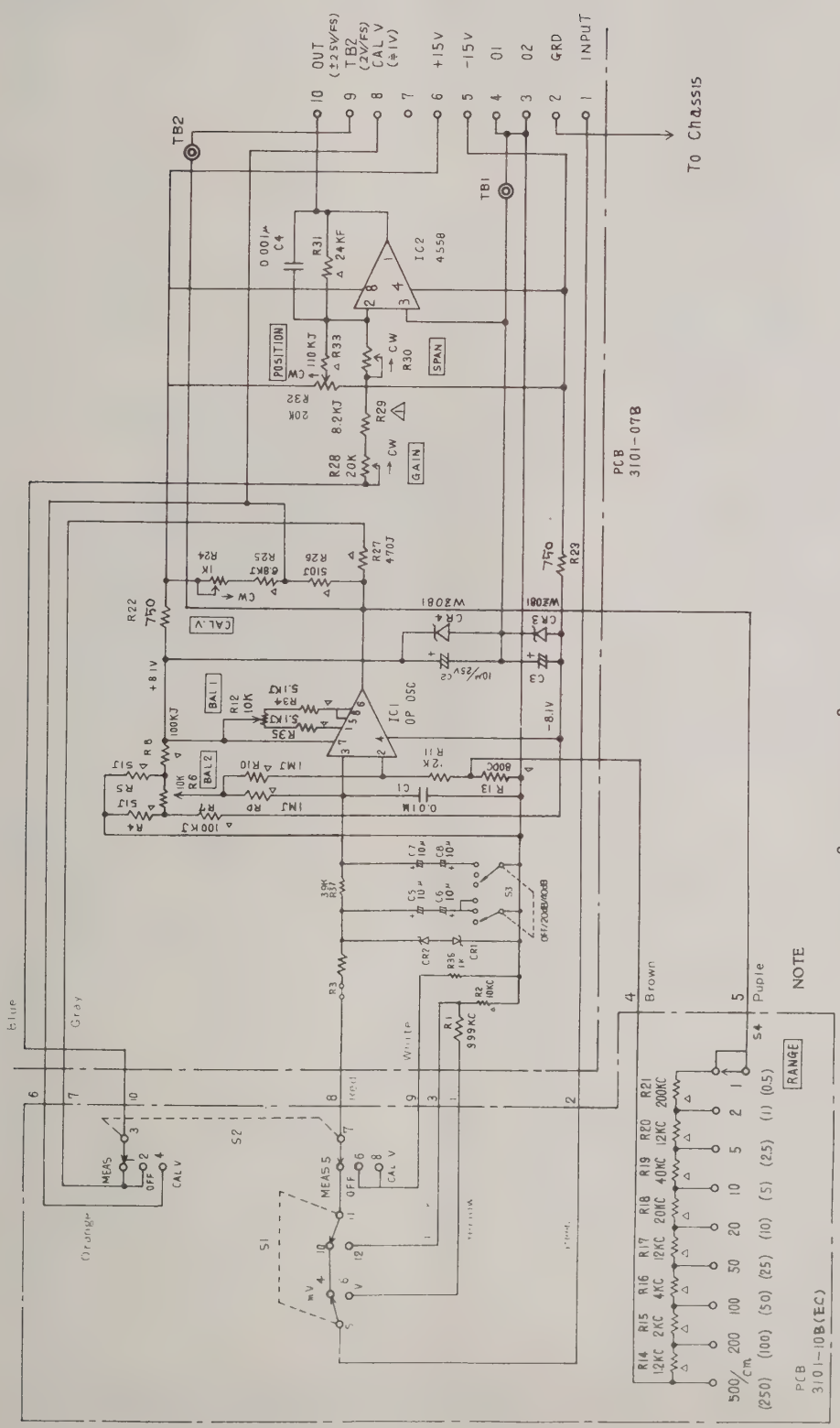


P1	No.	1	2	3
	SIG	+5V	VDH	GND

Printer Control Backup Unit

Figure	Part No.	Description	Type	Remarks
Q1	503203019	T, PNP –50V –2A 900mW	2SA1020, Y	
Q2	503203014	T, NPN 30V 100mA 200mW	2SC1815, Y	
R1	501810410	R, Metal Film 10K 1/4W ±1%	RN1/4-10KF	
R2	501810227	R, " 270 " "	RN1/4-270F	
R3	501810310	R, " 1K " "	RN1/4-1KF	
C1	502103034	C, Electrolytic 100μ 10WV	ECEA1AS101	
C2	502403007	C, Ceramic 0.01μ 50WV	ULD06-103-L2A	
BATT	517100006	Battery 3.6V	Battery, 3051FT-P	
P1	513400060	Connector, Pin Header 3P	HNC2-2.5P-3DSL	
PCB	511350080	Printed Circuit Board	PR3500-08	

5.2.17 Preamplifier (AH3301, AH3302)



Preamplifier (AH3301, AH3302)

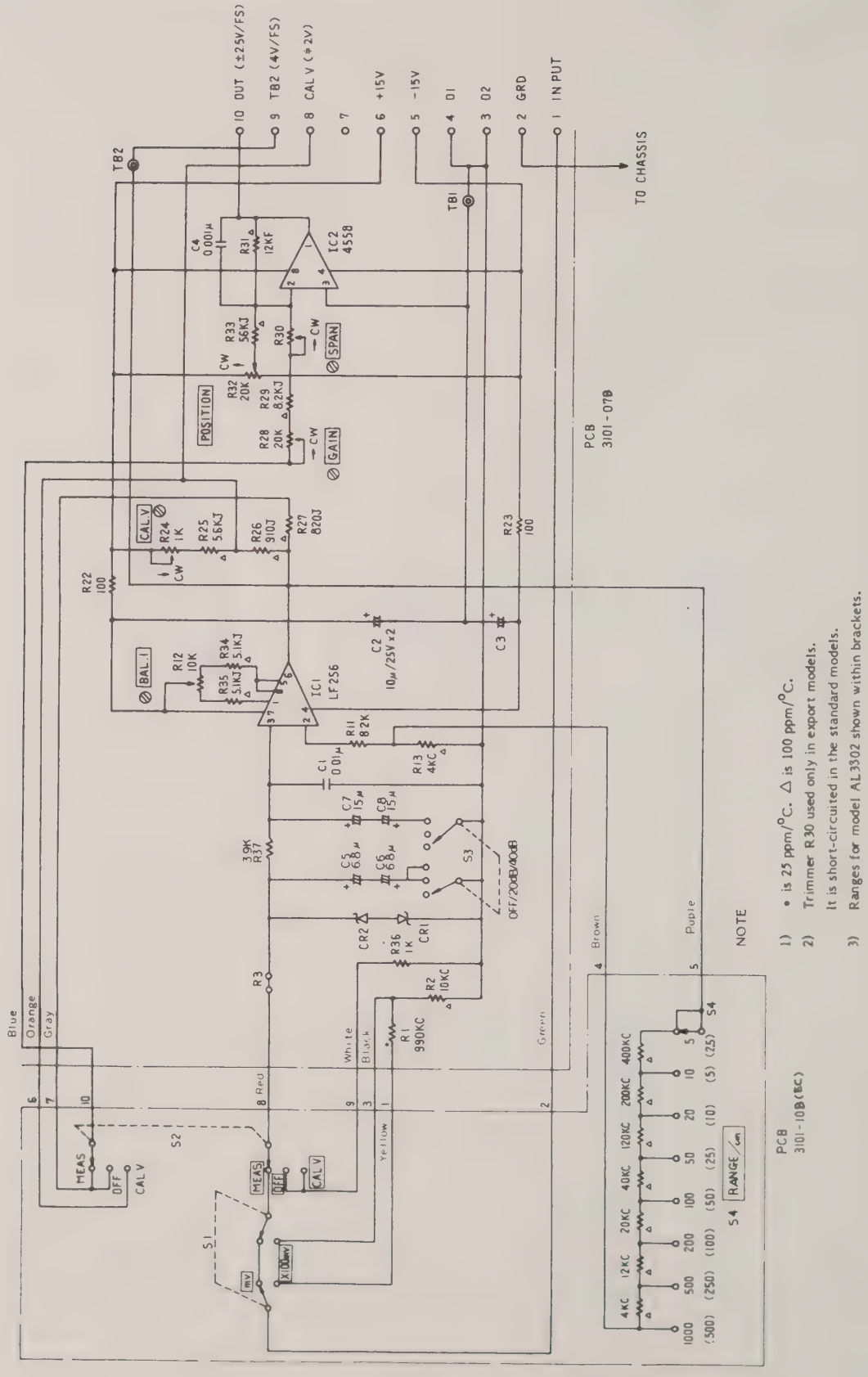
Figure	Part No.	Description				Type	Remarks
R1	501503302	R, Metal Film	999K	1/2W	±0.25%	RN65E999KC	
R2	501303301	R, "	1K	1/4W	±0.25%	RNE1/4-1KC	
R3	501810362	R, "	6.2K	1/4W	±1%	RN1/4-6.2KF	
R4	501810151	R, Metal Film	51	1/4W	±1%	RN1/4-51F	
R5	501810151	R, "	"	"	"	RN1/4-51F	
R6	504207021	R, Trimmer, Cermet	10K			TM10KPH-10K	
R7	501810510	R, Metal Film	100K	1/4W	±1%	RN1/4-100KF	
R8	501810510	R, "	"	"	"	RN1/4-100KF	
R9	501304704	R, "	1M	1/2W	±5%	RNE1/2-1MJ	
R10	501304704	R, "	"	"	"	RNE1/2-1MJ	
R11	501810412	R, "	12K	1/4W	±1%	RN1/4-12KF	
R12	504207048	R, Trimmer, Cermet	10K			TM10KPH-10K	
R13	501303315	R, Metal Film	800	1/4W	±0.25%	RNE1/4-800C	
R14	501303316	R, "	1.2K	1/4W	±0.25%	RNE1/4-1.2KC	
R15	501303317	R, "	2K	1/4W	±0.25%	RN1/4-2KC	
R16	501303308	R, "	4K	1/4W	±0.25%	RNE1/4-4KC	
R17	501303309	R, "	12K	1/4W	±0.25%	RNE1/4-12KC	
R18	501303310	R, "	20K	1/4W	±0.25%	RNE1/4-20KC	
R19	501303311	R, "	40K	1/4W	±0.25%	RNE1/4-40KC	
R20	501303312	R, "	120K	1/4W	±0.25%	RNE1/4-120KC	
R21	501303313	R, "	200K	1/4W	±0.25%	RNE1/4-200KC	
R22	501810275	R, Metal	750	1/4W	±1%	RN1/4-750F	
R23	501810275	R, "	"	"	"	"	
R24	504207049	R, Trimmer, Cermet	1K			TM10KPH-1K	
R25	501810368	R, Metal Film	6.8K	1/4W	±1%	RN1/4-6.8KF	
R26	501810251	R, "	510	1/4W	±1%	RN1/4-510F	
R27	501810247	R, "	470K	1/4W	±1%	RN1/4-470F	
R28	504103015	R, Variable Carbon	20K			RV16YP20SB20K	
R29	501303703	R, Metal Film	8.2K	1/4W	±5%	RNE1/4-8.2KJ	
R31	501810424	R, "	24K	1/4W	±1%	RN1/4-24KF	
R32	504103015	R, Variable Carbon	20K			RV16YP20SB20K	
R33	501810511	R, Metal Film	110K	1/4W	±1%	RN1/4-110KF	
R34	501810351	R, "	5.1K	1/4W	±1%	RN1/4-5.1KF	
R35	501810351	R, "	5.1K	1/4W	±1%	RN1/4-5.1KF	
R36	501810310	R, "	1K	1/4W	±1%	RN1/4-1KF	
R37	501810362	R, "	6.2K	1/4W	±1%	RN1/4-6.2KF	
C1	502303004	C, Mylar Film	0.01μ	50WV		MFL-05SI	
C2	502103128	C, Electrolytic	10μ	25WV		ECEA1EU100	
C3	502103128	C, "	"	"		ECEA1EU100	
C4	502303002	C, Mylar Film	0.001μ	50WV		MFL-05DI	
C5	502204004	C, Tantalum	10μ	16WV		CS15EIC100M1S-A	
C6	"	C, "	"	"		"	
C7	"	C, "	"	"		"	
C8	502204004	C, "	"	"		"	

Preamplifier (AH3301, AH3302)

(2/2)

Figure	Part No.	Description	Type	Remarks
CR1	G503100035	Di, Zener 6.8V 0.5W ±5%	RD6.8EB2	WZ065
CR2	G503100035	Di, " " " "	RD6.8EB2	WZ065
CR3	G503100007	Di, " 8.2V " "	RD8.2EB3	WZ081
IC1	A503300006	IC, Op-Amp	OP-05C	
IC2	A503300054	IC, " Dual	NJM4558D	
S1	508304008	Switch, Slide	SSA042L12	
S2	G508304002	"	SSA043L12	
S3	G508304003	"	SSA043L06	
S4	507101108	Switch, Rotary 1-1-9	SRM1019-15R-P	
TB1	B513400027	Test Terminal	LC-1-G	
TB1	B513400027	"	LC-1-G	
PCB	511310220	Printed Circuit Board	3101-07B	
PCB	511310301	"	3101-10(EC)	
	067117110	Spacer		Position
	516100016	Knob ϕ10mm, Black, with Line	021-222	Position
	516100028	" ϕ14.5mm, Black, with Line	023-342	Range
	516100018	Cap ϕ10mm, Black, with Line	040-162	Position
	516100029	" ϕ14.5mm, Black, with Line	040-362	Range
	516100030	Nut Cover ϕ14.5mm, Black, with Line	044-322	Range

5.2.18 Preamplifier (AL3301, AL3302)



NOTE

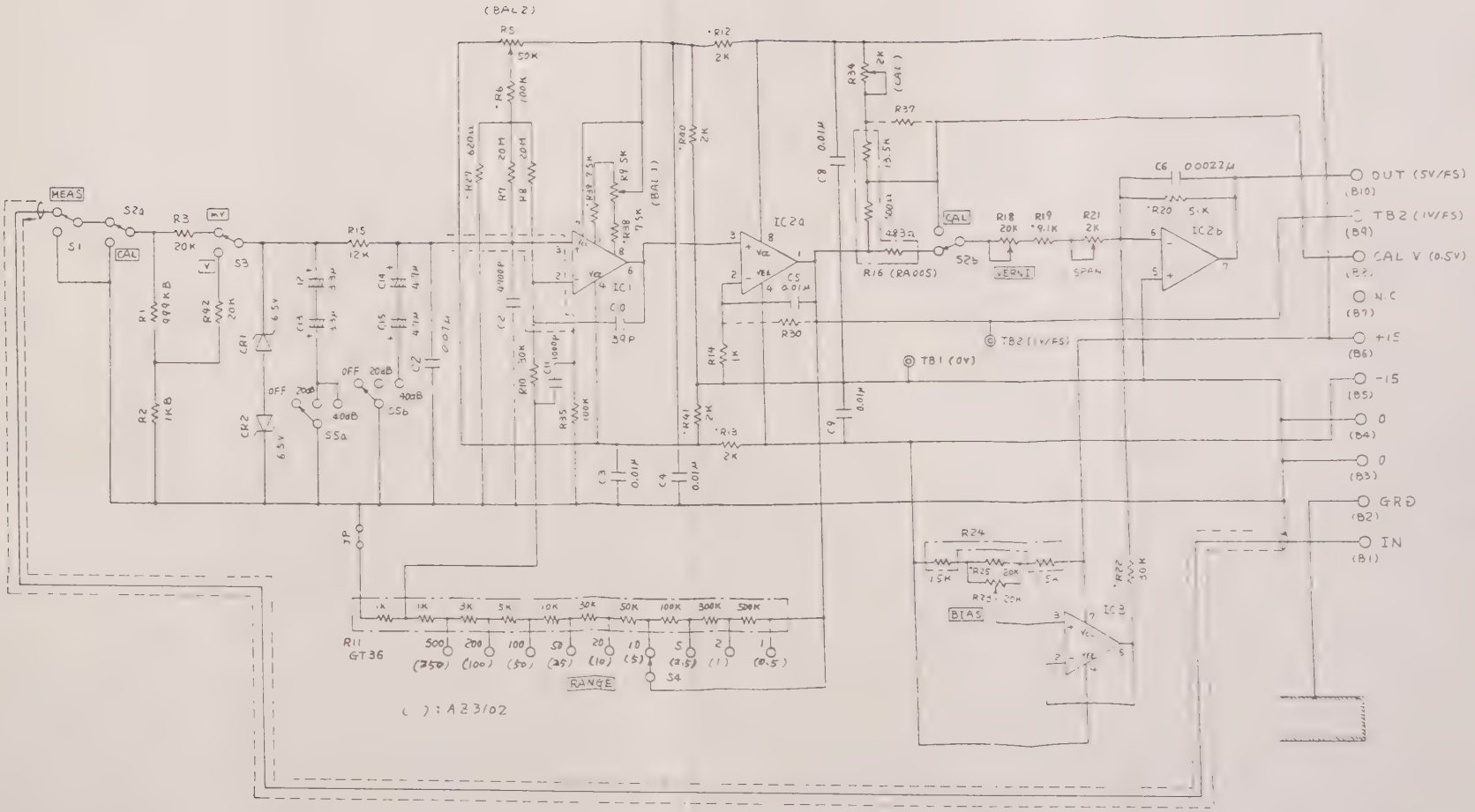
1) • is 25 ppm/°C. △ is 100 ppm/°C.
2) Trimmer R30 used only in export models.
   It is short-circuited in the standard models.
3) Ranges for model AL3302 shown within brackets.

Preamplifier (AL3301, AL3302)

Figure	Part No.	Description				Type	Remarks
R1	501503301	R, Metal Film	990K	1/2W	±0.25%	RN65E990KC	
R2	501303307	R, "	10K	1/4W	±0.25%	RNE1/4-10KC	
R3							SHORT
R11	501810382	R, Metal Film	8.2K	1/4W	±1%	RN1/4-8.2KF	
R12	504207021	R, Trimmer, Cermet	10K			TM10KPH-10K	
R13	501303308	R, Metal Film	4K	1/4W	±0.25%	RNE1/4-4KC	
R14	501813308	R, "	"	"	"	RNE1/4-4KC	
R15	501303309	R, "	12K	1/4W	±0.25%	RNE1/4-12KC	
R16	501303310	R, "	20K	1/4W	±0.25%	RNE1/4-20KC	
R17	501303311	R, "	40K	1/4W	±0.25%	RNE1/4-40KC	
R18	501303312	R, "	120K	1/4W	±0.25%	RNE1/4-120KC	
R19	501303313	R, "	200K	1/4W	±0.25%	RNE1/4-200KC	
R20	501303314	R, "	400K	1/4W	±0.25%	RNE1/4-400KC	
R22	501810210	R, "	100	1/4W	±1%	RN1/4-100F	
R23	501810210	R, "	"	"	"	RN1/4-100F	
R24	504207049	R, Trimmer, Cermet	1K			TM10KPH-1K	
R25	501810356	R, Metal Film	5.6K	1/4W	±1%	RN1/4-5.6KF	
R26	501810291	R, "	910	1/4W	±1%	RN1/4-910F	
R27	501810282	R, "	820	1/4W	±1%	RN1/4-820F	
R28	504103015	R, Variable Carbon	20K			RV16YP20SB20K	
R29	501810382	R, Metal Film	8.2K	1/4W	±1%	RN1/4-8.2KF	
R31	501810412	R, "	12K	1/4W	±1%	RN1/4-12KF	
R32	504103015	R, Variable Carbon	20K			RV16Y20SB20K	
R33	501810456	R, Metal Film	56K	1/4W	±1%	RN1/4-56KF	
R34	501810351	R, "	5.1K	1/4W	±1%	RN1/4-5.1KF	
R35	501810351	R, "	5.1K	1/4W	±1%	RN1/4-5.1KF	
R36	501810310	R, "	1K	1/4W	±1%	RN1/4-1KF	
R37	501810339	R, Metal Film	3.9K	1/4W	±1%	RN1/4-3.9KF	
C1	502303004	C, Mylar Film	0.01μ	50WV		MFL-05SI	
C2	502103128	C, Electrolytic	10μ	25WV		ECEA1EU100	
C3	502103128	C, "	"	"		ECEA1EU100	
C4	502303002	C, Mylar Film	0.001μ	50WV		MFL-05DI	
C5	502204001	C, Tantalum	6.8μ	16WV		CS15EIC6R8M1S-A	
C6	"	C, "	"	"		"	
C7	502204005	C, "	15μ	"		CS15EIC150M1S-A	
C8	"	C, "	"	"		"	
CR1	503100005	Di, Zener	13V	0.5W	±5%	WZ130	
CR2	503100005	Di, Zener	"	"	"	WZ130	
IC1	503300130	IC, Op-Amp	FET-Top			LF256	
IC2	503300054	IC, "	Dual			μPC4558C	
S1	508304008	Switch, Slide				SSA042L12	
S2	508304002	"				SSA032L12	
S4	507101107	Switch, Rotary	1-1-8			M1018-15R-P	

Preamplifier (AL3301, AL3302)

Figure	Part No.	Description	Type	Remarks
TB1	B513400027	Test Terminal	LC-1-G	
TB2	B513400027	"	LC-1-G	
PCB	511310220	Printed Circuit Board	3101-07B	
PCB	511310301	"	3101-10B(EC)	
	067117110	Spacer		Position
	516100016	Knob ϕ10mm, Black, with Line	021-222	Position
	516100028	" ϕ14.5mm, Black, with Line	023-342	Range
	516100018	Cap ϕ10mm, Black, with Line	040-162	Position
	516100029	" ϕ14.5mm, Black, with Line	040-362	Range
	516100030	Nut Cover ϕ14.5mm, Black, with Line	044-322	Range


(BAL 2)
R5
52K
R12
2K
R6
100K
R39
2K
(CAL)
R37
13.5K
C8
0.01μ
C6
0.0022μ
R20
5.1K
OUT (5V/FS)
(B10)
TB2 (1V/FS)
(B9)
CAL V (0.5V)
(B8)
N.C
(B7)
+15
(B6)
-15
(B5)
0
(B4)
0
(B3)
GRD
(B2)
IN
(B1)
MEAS
S2a
S1
CAL
R3
20K
mV
V
S3
R15
12K
R1
999KB
R42
20K
R2
1KB
CR1
6.5V
CR2
6.5V
C14
4.7μ
C15
4.7μ
C12
4.7μ
C13
4.7μ
C7
0.01μ
OFF
20dB
40dB
S5a
S5b
R27
620Ω
R7
20M
R8
20M
R38
7.5K
R9
9.5K
R38
7.5K
(BAL 1)
IC1
C2
4700P
C10
39P
R10
30K
C11
1000P
R35
100K
R40
2K
R41
2K
R13
2K
C3
0.01μ
C4
0.01μ
IC2a
C5
0.01μ
R30
R14
1K
C9
0.01μ
R16 (RA00S)
483Ω
CAL
S2b
R18
20K
VERNI
R19
9.1K
R21
2K
SPAN
IC2b
TB2 (1V/FS)
TB1 (0V)
JP
R11
GT36
1K
3K
5K
10K
30K
50K
100K
300K
500K
500
(250)
200
(100)
100
(50)
50
(25)
20
(10)
10
(5)
5
(2.5)
2
(1)
1
(0.5)
RANGE
S4
( ) : AZ3102
R24
15K
R25
20K
R25
20K
R22
30K
BIAS
IC3

Preamplifier (AZ3301, AZ3302)

Figure	Part No.	Description	Type	Remarks
IC1	503302039	IC, Op-Amp OP-05E-B		
IC2	503300054	IC, " Dual	μPC4558C	
IC3	503300023	IC, "	μPC741C	
CR1	503100035	Di, Zener 6.5V 5% 0.5W	WZ065	
CR2	"	Di, " " " "	"	
R1	501503204	R, Metal Film 999K 0.1% 1/4W 50ppm	RN65E999KB	
R2	501502202	R, " 1K " " "	RN60E1KB	
R3	501810420	R, " 20K 1% " 100ppm	RN1/4-20KF	
R5	505103024	R, Trimmer Cermet 50K	GF6X-50K	For BAL.
R6	501443651	R, Metal Film 100K 1% 1/4W 50ppm	RP44C100KF	
R7	501502216	R, " 20M 10% 1/8W 100ppm	RH1/8HVS20MK	
R8	"	R, " " " " " "	"	
R9	505101026	R, Trimmer, Cermet 5K	RJ20P-5K	For BAL.
R10	501810430	R, Metal Film 30K 1% 1/4W 100ppm	RN1/4-30KF	
R11	501003307	R, Array GT36		
R12	501443631	R, Metal Film 2K 1% 1/4W 50ppm	RP44C2KF	
R13	"	R, " " " " " "	"	
R14	501810310	R, " 1K " " 100ppm	RN1/4-1KF	
R15	501810412	R, " 12K " " "	RN1/4-12KF	
R16	501002809	R, Array RA005		
R18	504105006	R, Trimmer, Cermet 20K	GFP161-20SB20K	For VRNI.
R19	501443608	R, Metal Film 9.1K 1% 1/4W 50ppm	RP44C9.1KF	
R20	501443656	R, " 51K " " "	RP44C5KF	
R21	505103009	R, Trimmer, Cermet 2K	GF6X-2K	For SPAN.
R22	501443642	R, Metal Film 30K 1% 1/4W 50ppm	RP44C30KF	
R23	501405007	R, Trimmer, Cermet 20K	M1305-20K	For POS.
R24	501003309	R, Array RA940		
R25	501443614	R, Metal Film 20K 1% 1/4W 50ppm	RP44C20KF	
R27	501443602	R, " 620 " " "	RP44C620KF	
R34	505103009	R, Trimmer, Cermet 2K	GF6X-2K	For CAL.
R35	501810510	R, Metal Film 100K 1% 1/4W 100ppm	RN1/4-100KF	
R38	501443603	R, " 7.5K " " 50ppm	RP44C7.5KF	
R39	"	R, " " " " " "	"	
R40	501443631	R, " 2K " " "	RP44C2KF	
R41	"	R, " " " " " "	"	
R42	501443614	R, " 20K " " "	RP44C20KF	
C2	502303004	C, Mylar Film 0.001μ 50WV	MFL-05S1	
C3	502403007	C, Ceramic 10000p "	ULS06-103-L2A	
C4	"	C, " " "	"	
C5	502303004	C, Mylar Film 0.01μ "	MFL-05S1	

Preamplifier (AZ3301, AZ3302)

Figure	Part No.	Description			Type	Remarks
C6	502303001	C, Mylar Film	0.022μ	50WV	MFL05S22	
C8	502403007	C, Ceramic	10000p	"	UFD06-103-L2A	
C9	"	C, "	"	"	"	
C10	502403008	C, "	39p	"	USD04SL390K-K2J	
C11	502303002	C, Mylar Film	0.001μ	"	MFL05D1	
C12	502204003	C, Tantalum	3.3μ	16WV	CS15E1C3R3MIS-A	
C13	502204003	C, "	3.3μ	"	"	
C14	502204002	C, "	4.7μ	"	CS15E1C4R7MIS-A	
C15	"	C, "	"	"	"	
S1	508301001	Switch, Slide	1-2		J-S4036#01-W	For MEAS
S2	508302012	"	2-2		J-S5089#01-W	For CAL
S3	508301001	"	1-2		J-S4036#01-W	For mv, v.
S4	507111108	Switch, Rotary	1-1-9		J-R2000	For RANGE
S5	508304003	Switch, Slide	4-3		SSA043L06	For Filter
PCB	511400080	Printed Circuit Board			PR4000-06B	

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